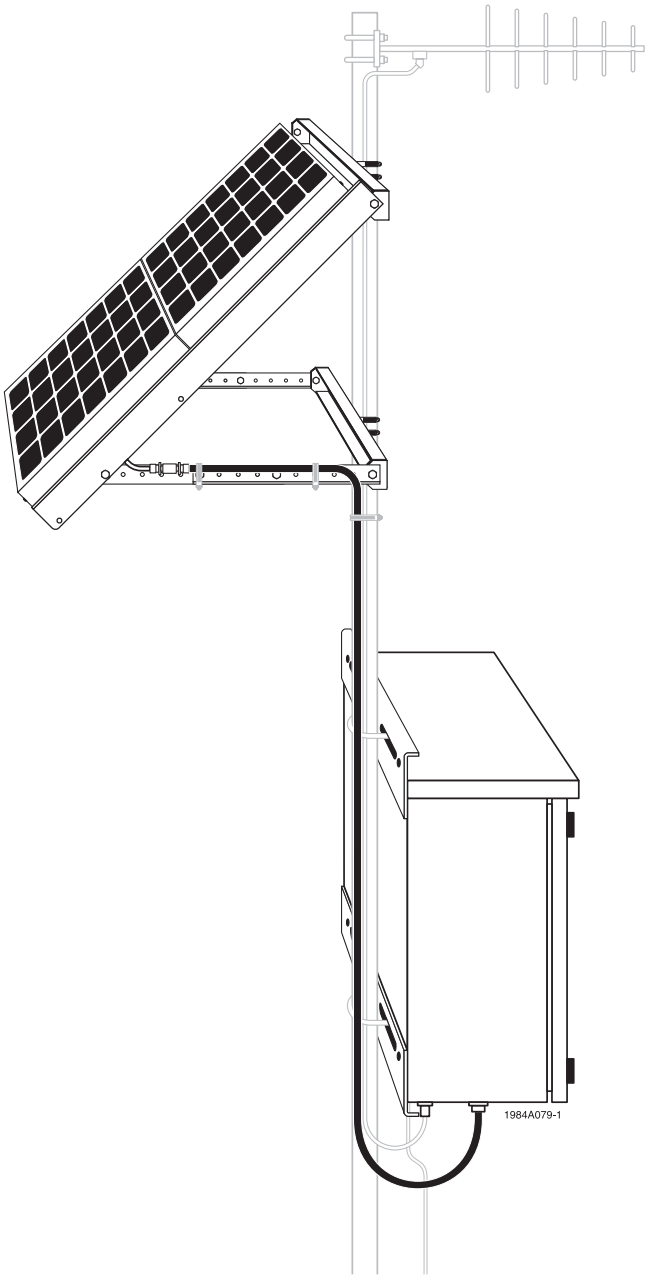
PHOENIX CONTACT
INSPIRING INNOVATIONS

RAD 24-Volt Solar Interface Systems (SIS) User Manual

For 40-, 60-, 80-, and 100-watt Systems



INSPIRING INNOVATIONS

RAD 24-Volt Solar Interface Systems (SIS) User Manual

Provides 40, 60, 80 or 100 watts of solar power for wireless products:

- RAD-SOL-SET-24-40 (40-watt)
- RAD-SOL-SET-24-60 (60-watt)
- RAD-SOL-SET-24-80 (80-watt)
- RAD-SOL-SET-24-100 (100-watt)

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This Manual Contains Information on the

Phoenix Contact RAD-SOL-SET-24 Solar Interface Systems (SIS)

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SECTION 1
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1.1 General

Thank you for your purchase of this Phoenix Contact Solar Interface System (SIS). Phoenix Contact Solar Interface Systems are designed to provide reliable remote power for your wireless products throughout the year.

1.2 Safety

Electricity, even at low voltages, can be dangerous. For your protection, Phoenix Contact recommends that installation, maintenance and repairs be performed by licensed or qualified personnel in strict accordance with applicable health, safety, building and electrical codes.

In order to guarantee the safe use of your device, we recommend that you read this manual carefully.

1.3 About this Manual

This manual contains the information necessary to understand, install, operate and order parts for Phoenix Contact Solar Interface Systems (SIS) and associated components. The table of contents at the front of this manual provides a paragraph-by-paragraph breakdown of the subject matter covered in each section.

For your protection, Phoenix Contact recommends that installation, maintenance and repairs be performed by licensed or qualified personnel in strict accordance with applicable health, safety, building and electrical codes.

Specifications within the text of this manual are given in the International System of Units (SI), with English equivalents in parentheses. Fully capitalized words within the text indicate markings found on the equipment. Warnings, Cautions and Notes are used to emphasize critical instructions:

⚠ WARNING

An operating procedure, practice, etc., which, if not carefully followed, could result in personal injury.

⚠ CAUTION

An operating procedure, practice, etc., which, if not strictly observed, could result in damage to the equipment.

NOTE

Highlights important information about an operating procedure or the equipment.

1.4 Current Documentation on the Internet

Make sure you are always working with the latest documentation published. The latest changes or additional information can be found on the Internet at:

http://www.phoenixcon.com (under "PRODUCTS" select "Info Service")

1.5 Product Description

A. Components and Assemblies

Components and assemblies that make up the Phoenix Contact 24/40 Solar Interface System are identified in Figure 1-1. The major components of the system are:

- Photovoltaic solar modules
- Solar module mounting bracket with stainless steel hardware
- NEMA 4 rugged aluminum outdoor equipment enclosure with separate NEMA 3R battery compartment, white powder-coated finish, lockable
- Sealed, gel-cell, deep-cycle batteries
- Pre-wired and installed electronics panel with charge/load controller, fuses and labeled terminal blocks

1.6 System Topology

Each SIS is a “stand-alone” DC solar power system that uses photovoltaic modules to charge a sealed, deep-cycle battery. Power from the battery is then used to power your equipment. A typical SIS installation is shown in Figure 1-2.

1.7 System Power Flow

Power flow is controlled by a charge controller located on the electronics panel inside the enclosure. A diagram of the SIS power flow is shown in Figure 1-3.

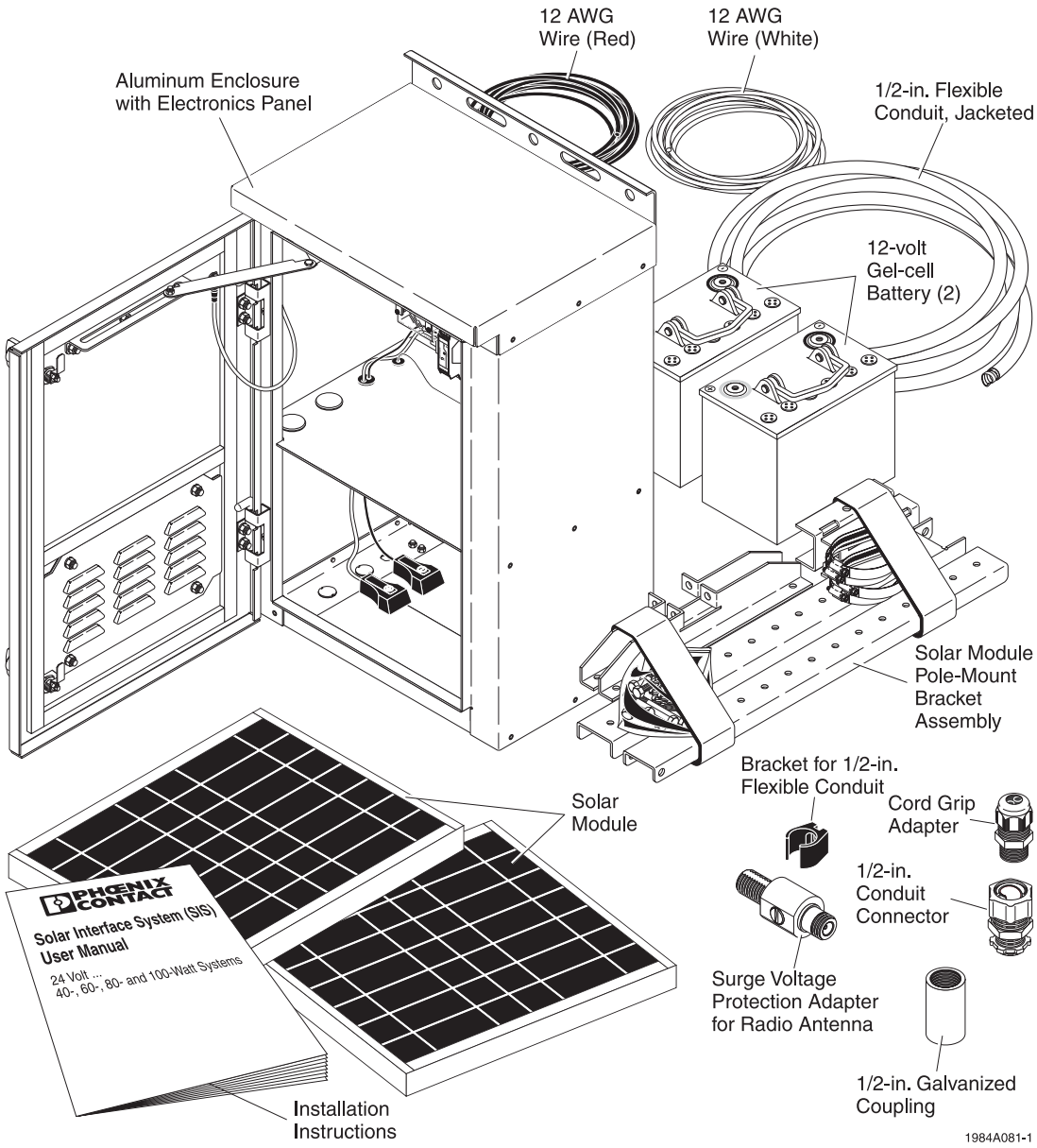


FIgure 1.1 Components and Assemblies of the Phoenix Contact Solar Interface System (SIS)

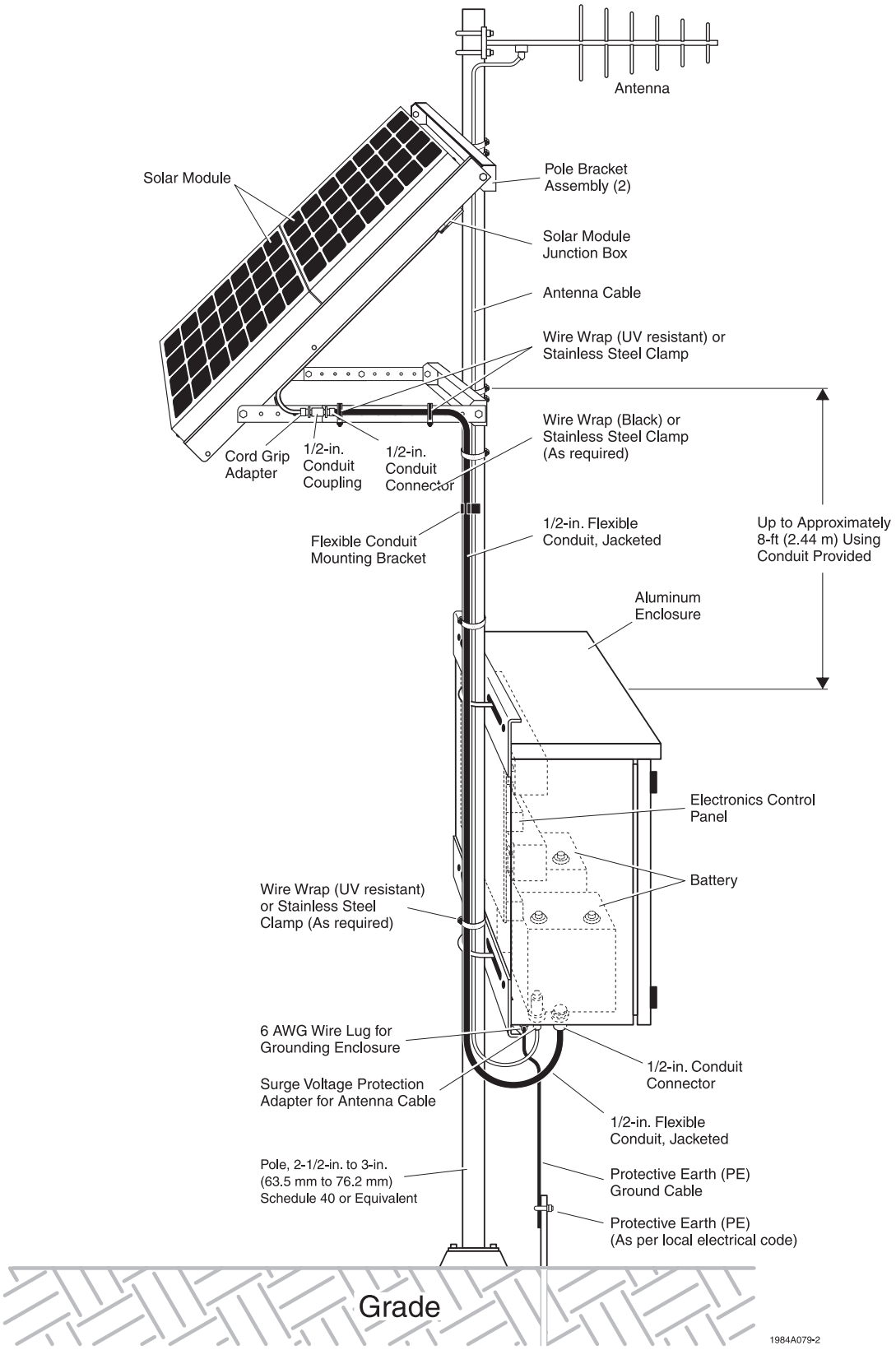

Antenna
Solar Module
Pole Bracket Assembly (2)
Solar Module Junction Box
Antenna Cable
Wire Wrap (UV resistant) or Stainless Steel Clamp
Wire Wrap (Black) or Stainless Steel Clamp (As required)
Cord Grip Adapter
1/2-in. Conduit Coupling
1/2-in. Conduit Connector
Flexible Conduit Mounting Bracket
1/2-in. Flexible Conduit, Jacketed
Up to Approximately 8-ft (2.44 m) Using Conduit Provided
Aluminum Enclosure
Electronics Control Panel
Battery
Wire Wrap (UV resistant) or Stainless Steel Clamp (As required)
6 AWG Wire Lug for Grounding Enclosure
Surge Voltage Protection Adapter for Antenna Cable
1/2-in. Conduit Connector
1/2-in. Flexible Conduit, Jacketed
Pole, 2-1/2-in. to 3-in. (63.5 mm to 76.2 mm) Schedule 40 or Equivalent
Protective Earth (PE) Ground Cable
Protective Earth (PE) (As per local electrical code)
Grade
1984A079-2

Figure 1-2. Example of Typical Solar Interface System Installation

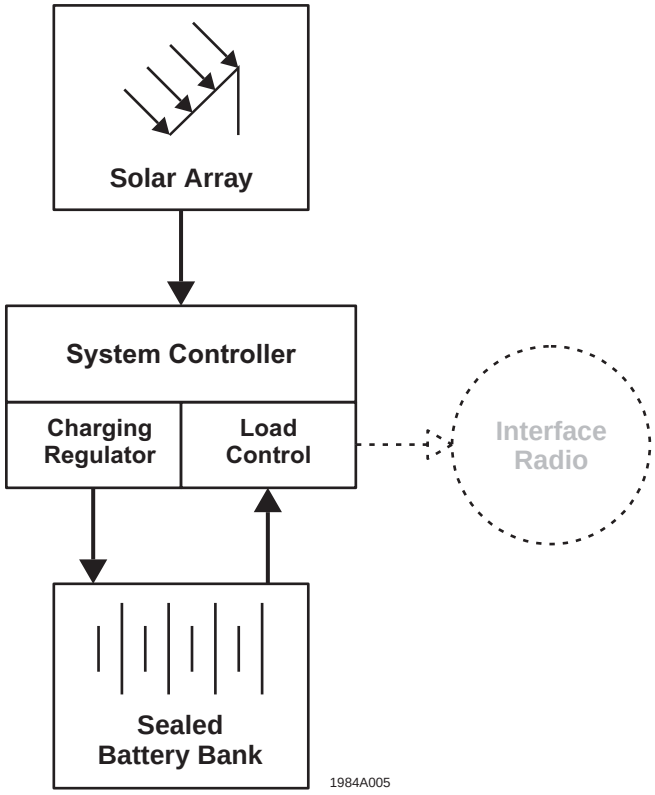


Figure 1-3. Diagram of the Solar Interface System Charge and Control Functions

1.8 Unpacking and Inspection

SIS components were inspected before shipment. After unpacking, inspect each component for possible damage that may have occurred during shipping. Items supplied with your Solar Interface System are shown in Figure 1-1. If items are missing or damaged, or if you have any questions, please call Phoenix Contact:

Technical Service at 1-800-322-3225.

SECTION 2
Technical Data

Section 2 Contents

2.1 General 2-1
2.2 Dimensions – Solar Modules 2-4
2.3 Dimensions – SIS Enclosure 2-5

2.1 General

This section provides technical information about the components that were supplied with your Solar Interface System (SIS). You should become familiar with the specifications for the items listed in Tables 2-1 thru 2-9. Figures 2-1 and 2-2 provide the basic dimensions for the solar modules and the SIS enclosure.

- Phoenix Contact Solar Interface System (SIS)
- Solar charge controller
- Solar batteries
- Solar modules

Phoenix Contact reserves the right to make any necessary changes that advances the technology and performance of the product.

Table 2-1. Phoenix Contact Solar Interface System Specifications

System voltage	24 V DC
Solar module input wattage	40/60/80/100 W
Load requirements	see load calculator @ www.phoenixcon.com/wireless
Wireless transmitters, receivers & repeaters	see wireless interface products @ www.phoenixcon.com/wireless
Isolators and converters	see www.phoenixcon.com/wireless
Surge voltage protection	see www.phoenixcon.com (from “Products” menu select “Online Catalog,” then choose TRABTECH)
Antenna	see antenna selector @ www.phoenixcon.com/wireless
Pole size	2.5-in. (2.875-in. OD) to 3-in. (3.50-in. OD) schedule 40 or equivalent

1984A067

Table 2-2. RAD-SOL-CHG-24-10 Solar Charge Controller Specifications

Nominal voltage	24 V DC
Rated solar input	10 A
Rated load current	10 A
Regulation voltage	
Sealed battery	28.2 V
Load disconnect	23.0 V
Load reconnect	25.2 V
Temperature compensation (mV/°C)	-56 mV
Self consumption	10 mA
Operating temperature range	-40 to +85°C
Wire size	10 AWG (5.2 mm^2)

1984B065

Table 2-3. RAD-SOL-BAT-12-40 Solar Battery Specifications (40-watt System)

Type	valve-regulated lead-acid, deep-cycle gelled electrolyte
Alloy	lead calcium
Nominal voltage	12 V
Ampere Hour (Ah) capacity	48 Ah at a 100 hour discharge rate
Dimensions mm (in.)	
• Length	197.0 mm (7.75 in.)
• Width	169.0 mm (6.63 in.)
• Height	175.0 mm (6.88 in.)
Weight kg (lb)	14.5 kg (32.5 lb)

198BA098

Table 2-4. RAD-SOL-BAT-12-70 Solar Battery Specifications (60-watt System)

Type	valve-regulated lead-acid, deep cycle-gelled electrolyte
Alloy	lead calcium
Nominal voltage	12 V
Ampere Hour (Ah) capacity	70 Ah at a 100 hour discharge rate
Dimensions mm (in.)	
• Length	259.0 mm (10.19 in.)
• Width	169.0 mm (6.63 in.)
• Height	178.0 mm (7.00 in.)
Weight kg (lb)	19.1 kg (42 lb)

1984A099

Table 2-5. RAD-SOL-BAT-12-84 Solar Battery Specifications (80/100-watt System)

Type	valve-regulated lead-acid, deep-cycle gelled electrolyte
Alloy	lead calcium
Nominal voltage	12 V
Ampere Hour (Ah) capacity	84 Ah at a 100 hour discharge rate
Dimensions mm (in.)	
• Length	276.9 mm (10.9 in.)
• Width	172.7 mm (6.8 in.)
• Height	251.5 mm (9.9 in.)
Weight kg (lb)	24.26 kg (53.5 lb)

1984B064

Table 2-6. RAD-SOL-PAN-12-20 Solar Module Specifications (40-watt System)

Total power output at peak sun	
Volts	16.8 V
Amps	1.19 A
Watts	18 W
Dimensions mm (in.)	
Length	424 mm (16.7 in.)
Width	502 mm (19.8 in.)
Thickness	50 mm (1.97 in.)
Weight kg (lb)	3 kg (6.5 lb)
Certification/Approval	UL Listed

1984A094-1

Table 2-7. RAD-SOL-PAN-12-30 Solar Module Specifications (60-watt System)

Total power output at peak sun	
Volts	16.8 V
Amps	1.78 A
Watts	27 W
Dimensions mm (in.)	
Length	594 mm (23.4 in.)
Width	502 mm (19.8 in.)
Thickness	50 mm (1.97 in.)
Weight kg (lb)	3.9 kg (8.5 lb)
Certification/Approval	UL Listed

1984A095-1

Table 2-8. RAD-SOL-PAN-12-40 Solar Module Specifications (80-watt System)

Total power output at peak sun	
Volts	16.9 V
Amps	2.34 A
Watts	40 W
Dimensions mm (in.)	
Length	526 mm (20.7 in.)
Width	6522 mm (25.7 in.)
Thickness	36 mm (1.42 in.)
Weight kg (lb)	4.5 kg (9.9 lb)
Certification/Approval	UL Listed

1984A096-1

Table 2-9. RAD-SOL-PAN-12-50 Solar Module Specifications (100-watt System)

Total power output at peak sun	
Volts	16.7 V
Amps	3.00 A
Watts	50 W
Dimensions mm (in.)	
Length	639 mm (25.2 in.)
Width	652 mm (25.7 in.)
Thickness	54 mm (2.1 in.)
Weight kg (lb)	5.0 kg (11.0 lb)
Certification/Approval	UL Listed

1984A097-1

2.2 Dimensions – Solar Modules

Figure 2-1 provides dimensions for 40-, 60-, 80- and 100-watt systems.

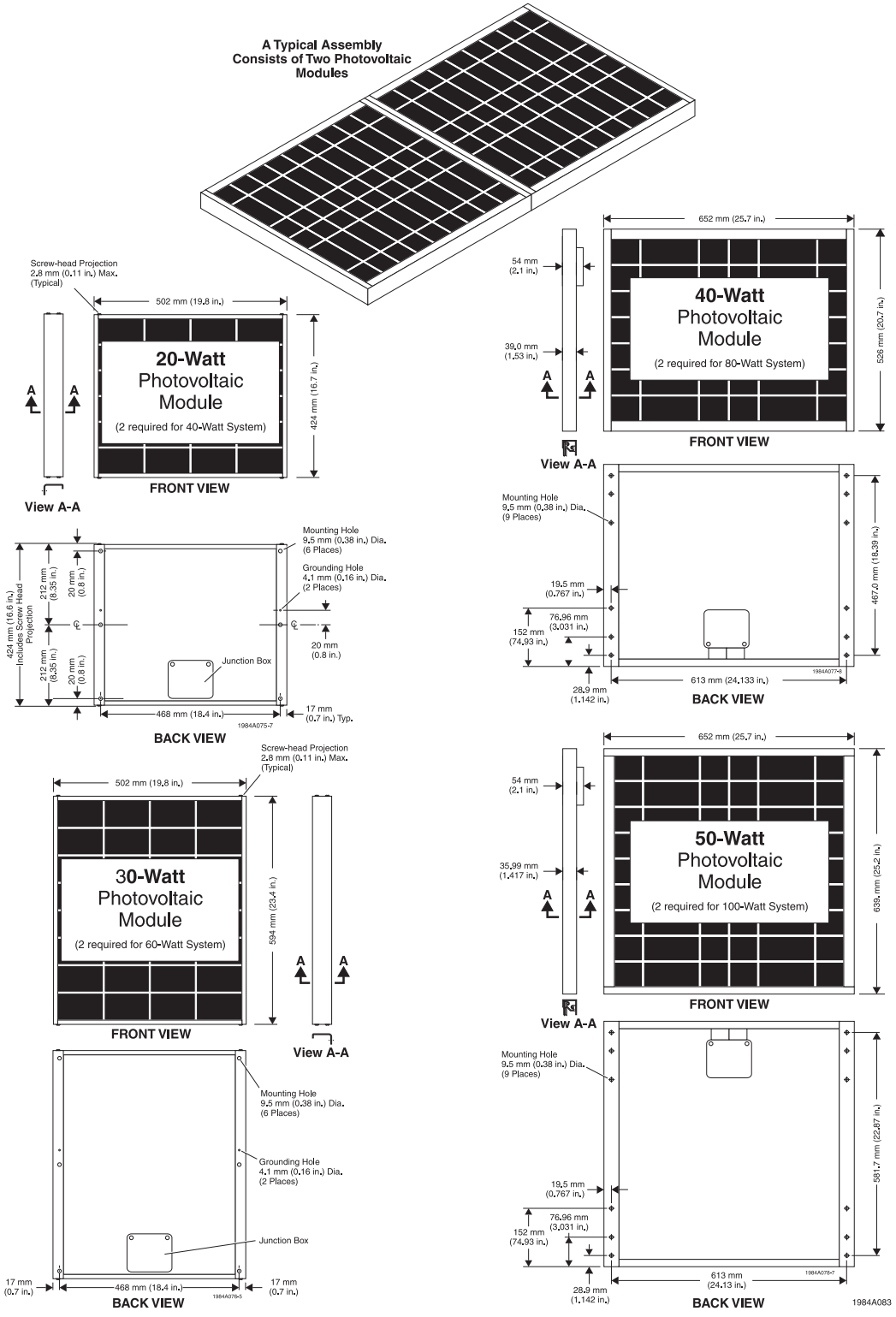

A Typical Assembly Consists of Two Photovoltaic Modules
Screw-head Projection 2.8 mm (0.11 in.) Max. (Typical)
502 mm (19.8 in.)
20-Watt Photovoltaic Module
(2 required for 40-Watt System)
424 mm (16.7 in.)
FRONT VIEW
View A-A
Mounting Hole 9.5 mm (0.38 in.) Dia. (6 Places)
Grounding Hole 4.1 mm (0.16 in.) Dia. (2 Places)
424 mm (16.6 in.) Includes Screw Head Projection
212 mm (8.35 in.)
20 mm (0.8 in.)
Junction Box
468 mm (18.4 in.)
17 mm (0.7 in.) Typ.
1984A075-7
BACK VIEW
652 mm (25.7 in.)
54 mm (2.1 in.)
39.0 mm (1.53 in.)
40-Watt Photovoltaic Module
(2 required for 80-Watt System)
526 mm (20.7 in.)
FRONT VIEW
View A-A
Mounting Hole 9.5 mm (0.38 in.) Dia. (9 Places)
19.5 mm (0.767 in.)
76.96 mm (3.031 in.)
152 mm (74.93 in.)
467.0 mm (18.39 in.)
28.9 mm (1.142 in.)
613 mm (24.133 in.)
1984A077-8
BACK VIEW
Screw-head Projection 2.8 mm (0.11 in.) Max. (Typical)
502 mm (19.8 in.)
30-Watt Photovoltaic Module
(2 required for 60-Watt System)
594 mm (23.4 in.)
FRONT VIEW
View A-A
Mounting Hole 9.5 mm (0.38 in.) Dia. (6 Places)
Grounding Hole 4.1 mm (0.16 in.) Dia. (2 Places)
Junction Box
17 mm (0.7 in.)
468 mm (18.4 in.)
17 mm (0.7 in.)
1984A076-5
BACK VIEW
652 mm (25.7 in.)
54 mm (2.1 in.)
35.99 mm (1.417 in.)
50-Watt Photovoltaic Module
(2 required for 100-Watt System)
639. mm (25.2 in.)
FRONT VIEW
View A-A
Mounting Hole 9.5 mm (0.38 in.) Dia. (9 Places)
19.5 mm (0.767 in.)
76.96 mm (3.031 in.)
152 mm (74.93 in.)
581.7 mm (22.87 in.)
28.9 mm (1.142 in.)
613 mm (24.13 in.)
1984A076-7
BACK VIEW
1984A083

Figure 2-1. Solar Module Dimensions

2.3 Dimensions – SIS Enclosure

Figure 2-2 provides dimensions for the SIS enclosure.

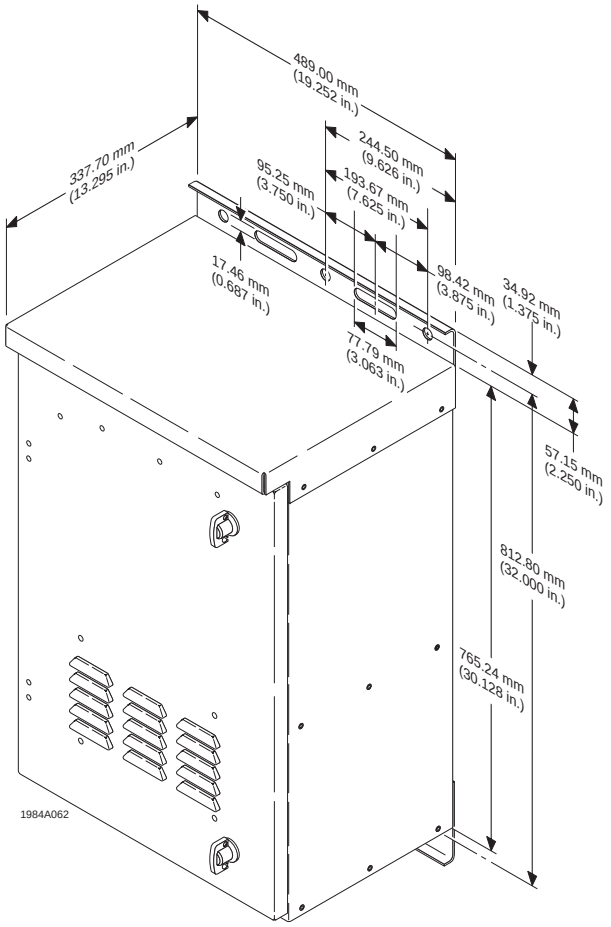


Figure 2-2. Enclosure Dimensions

SECTION 3
SIS Location Considerations

Section 3 Contents

3.1 Solar Insolation Values Worldwide 3-1
3.2 Checking Sun Path for Obstructions 3-1
3.3 Solar Module Orientation 3-3
3.4 Solar Module Tilt Angle 3-4

3.1 Solar Insolation Values Worldwide

It is important that solar energy provided by the SIS is sufficient to meet your load requirements.

Figure 3-1 is a map showing average solar insolation values around the world. The map values stated are worse case and in units of kilowatt-hours per square meter. For specific solar insolation values applicable to your area or for help with calculating daily load requirements and appropriate array size, call Phoenix Contact Technical Service at **(800) 322-3225**.

3.2 Checking Sun Path for Obstructions

CAUTION

The solar array must be located in an open area that will receive unobstructed sun during the entire day throughout the year.

After determining the general location for your Solar Interface System, check sun path at that location for obstructions:

1. On a clear day, stand at the exact spot where the Solar Interface System is to be installed.

Note

In the winter, the sun will rise to the south of due east and set to the south of due west. Likewise, in the summer, the sun will rise to the north of due east and set to the north of due west.

2. Using a compass as a guide, look toward the horizon due east of your position. Then

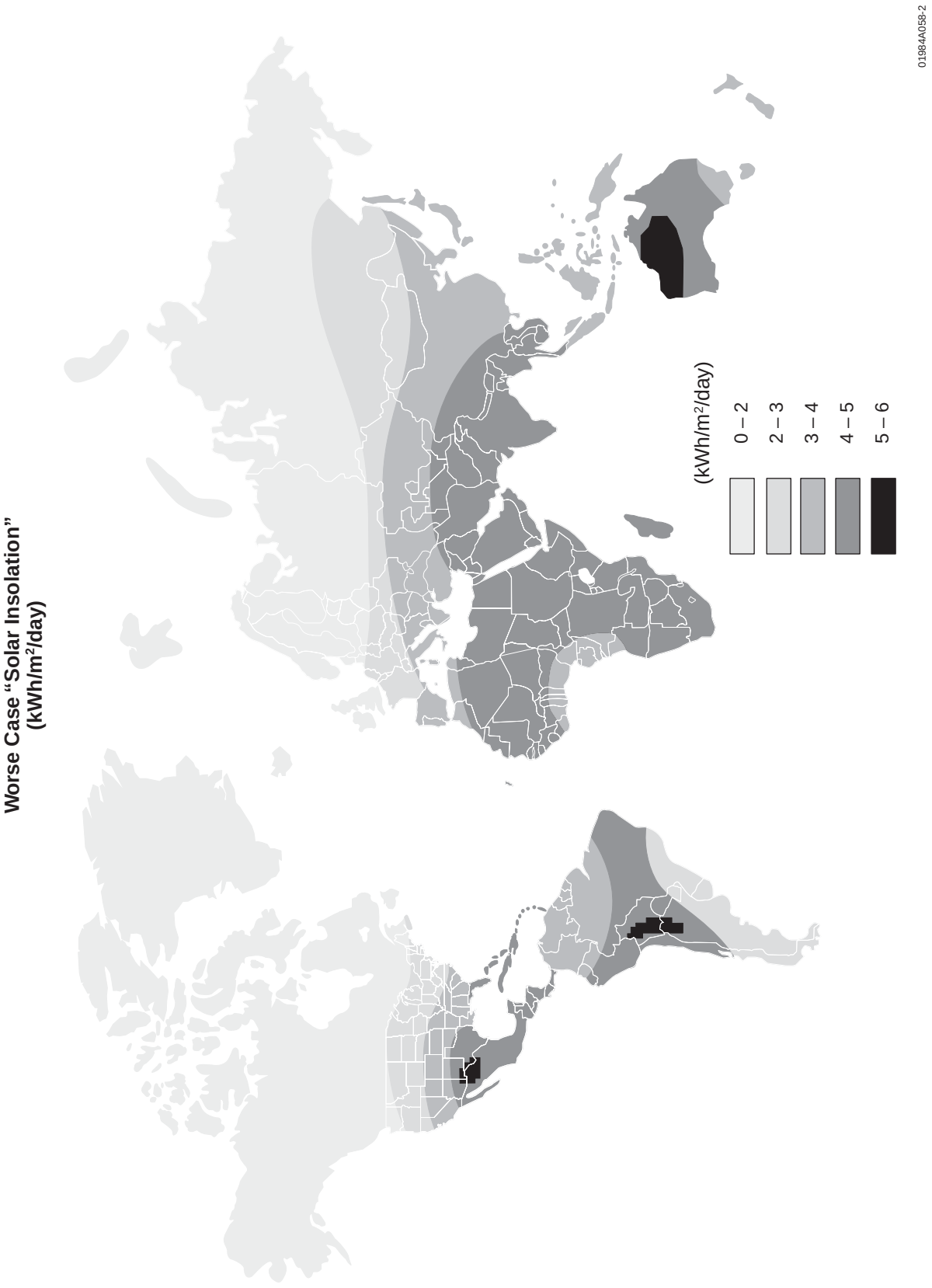


Figure 3-1. Average Daily Solar Insolation Values

turn and look to the horizon due west of your position. See Figure 3-2.

3. Make sure there are no obstructions that will shade your Solar Interface System between 9:00 am and 4:00 pm during the summer and winter sun paths. Also consider shading from future growth or buildings.

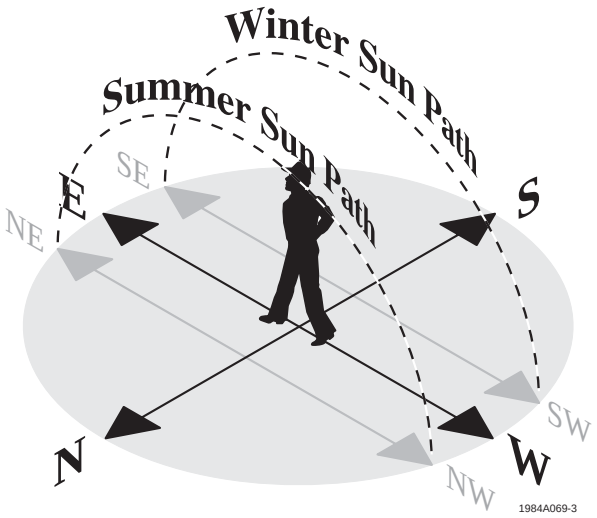


Figure 3-2. Checking Summer and Winter Sun Paths for Obstructions

3.3 Solar Module Orientation

If your site is located in the northern hemisphere, face the solar module true south. See Figure 3-3. Similarly, if your site is located in the southern hemisphere, face the solar module true north.

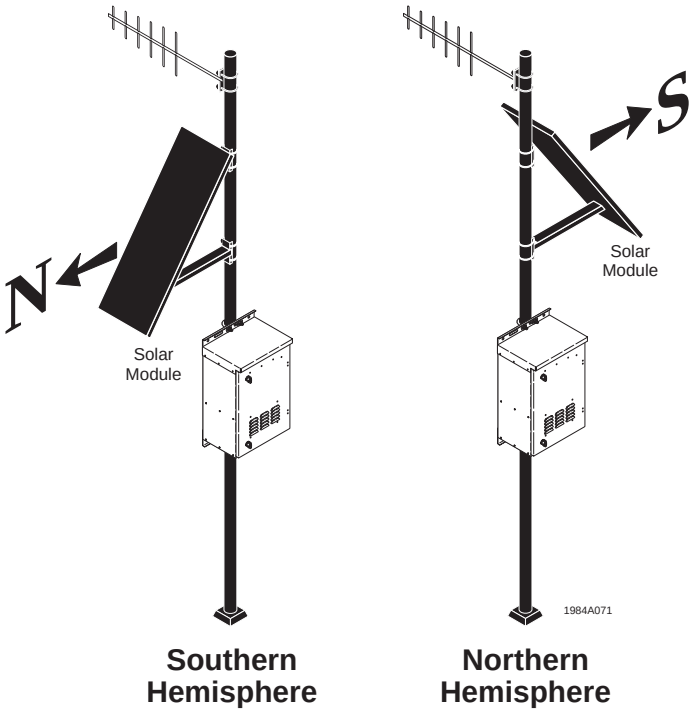


Figure 3-3. Solar Module Orientation

3.4 Solar Module Tilt Angle

Once the solar module has been attached to the structure, you will need to adjust the “tilt angle” of the module to obtain optimum performance. The tilt angle is based on the latitude at your SIS location. Therefore, you will need to know the approximate latitude of your SIS location before setting the tilt angle. Use the map below to determine the appropriate tilt angle.

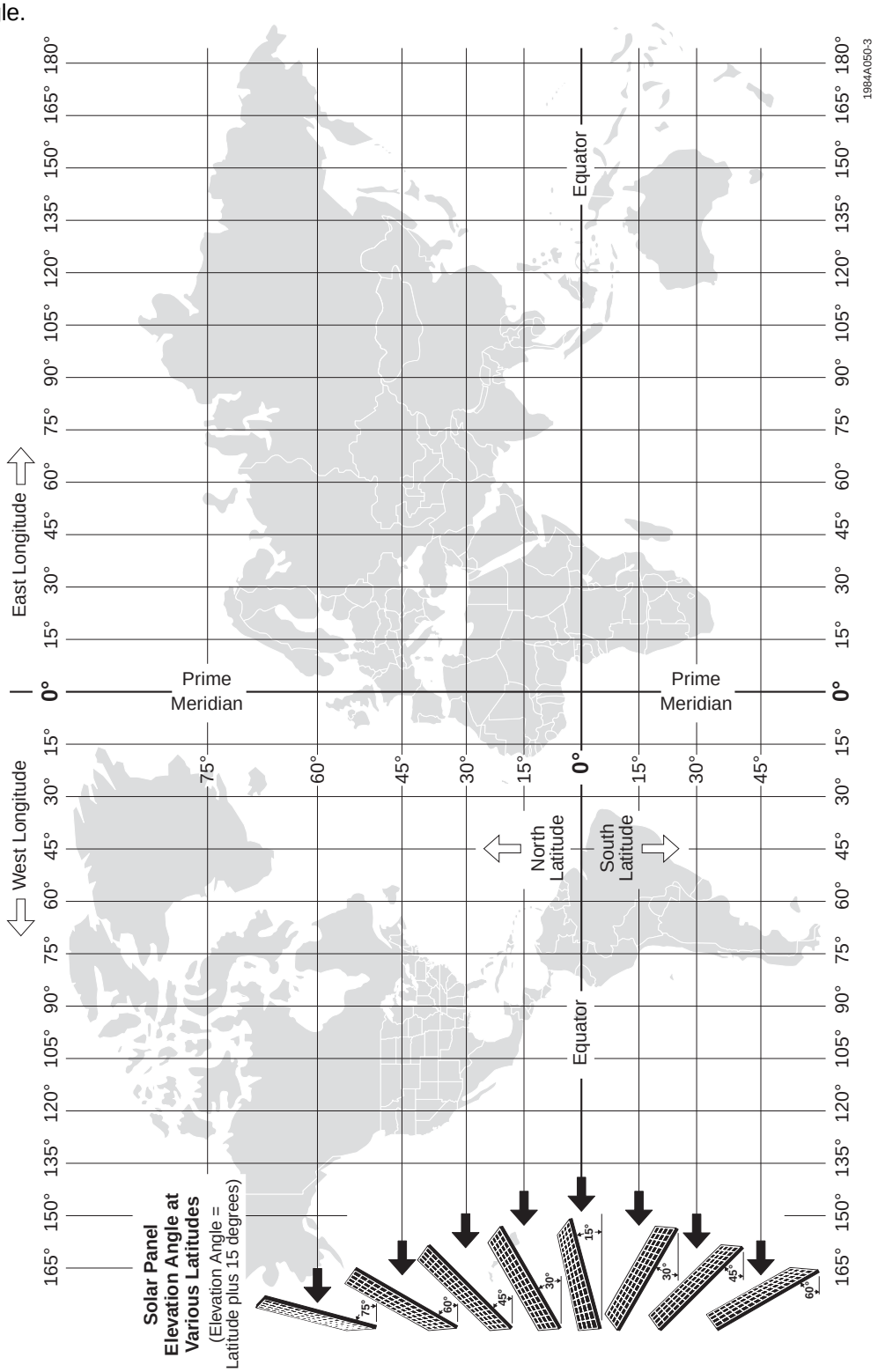


Figure 3-4. Solar Module Orientation

SECTION 4
Installation Procedures

Section 4 Contents

4.1 General 4-2
4.2 Safety Precautions 4-2
4.3 Tools and Equipment 4-2
4.4 Additional Material Considerations 4-3
4.5 Mounting Pole 4-3
4.6 Installing the SIS Enclosure 4-3
4.7 System Grounding 4-6
4.8 Removing Fuses from Electronics Panel 4-8
4.9 Installing Coax Cable Surge Protector 4-9
4.10 Installing Radio and Antenna Adapter 4-10
4.11 Installing the Solar Modules 4-11
4.12 Wiring the Enclosure 4-14
4.12.1 Enclosure Wiring 4-14
4.12.2 Wiring the Solar Module Junction Box 4-18
4.12.3 Grounding the Solar Module 4-20
4.13. Installing the Antenna 4-21
4.14 Installing Flexible Conduit Mounting Brackets 4-21
4.15 Installing the Battery 4-21
4.16 Final Checkout 4-24

⚠ WARNING

Electricity, even at low voltages, can be very dangerous. For your protection, Phoenix Contact recommends that all electrical installations, maintenance and repairs be performed only by licensed and/or properly qualified individuals and in strict accordance with applicable health, safety, building and electrical codes.

4.1 General

This section provides the information necessary to install the Phoenix Contact Solar Interface System (SIS). Before installing the SIS, you should become familiar with SIS component names as defined in Section 1 and solar module orientation requirements outlined in Section 2.

4.2 Safety Precautions

Before attempting to install and wire this SIS, please read all instructions carefully. We recommend placing this manual in the SIS enclosure for future reference.

⚠ WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Therefore, when working with PV modules or making wiring connections during the daytime, cover solar modules with an opaque material.

⚠ WARNING

For your protection and protection of the equipment when making solar module, battery or load connections, always make sure that the SIS fuses are removed from fuse terminal blocks located on the electronics panel of the enclosure.

⚠ WARNING

To prevent short circuits and damage to the equipment when installing the battery: (1) Exercise extra caution when placing the battery into the enclosure. (2) Always double check your positive and negative polarity before connecting the battery cables. Always use insulated tools when working on electrical equipment.

4.3 Tools and Equipment

No tools were supplied with your SIS. However, we suggest that you have the following tools to ensure a successful installation.

- Compass
- Slotted-head screwdriver
- Wire cutters
- Crimping tool
- Open-end wrench set (standard)
- Pliers
- Utility knife
- Protractor
- Phillips-head screwdriver
- Stripping tool
- Multimeter
- Socket set (standard)
- Hacksaw

4.4 Additional Material Considerations

The following is a list of materials you may need to complete the installation.

- Foundation
- Earth-ground rod, ground cable and clamps (per local codes)
- Mounting pole; 63.5 mm to 76.2 mm (2-1/2 in. to 3 in.) diameter. Suitable for mounting antenna, solar module and enclosure.
- Antenna
- External antenna cable
- Internal antenna adapter (see ordering data)
- Wire for connecting external sensors, switchgear, etc.
- U-bolts for pole-mounted installations, or lag screws for wall mounted installations
- Wire wraps
- Radios and accessories. Visit our web site: **http://www.phoenixcon.com**
- Antenna splitter for multiple radios. Visit our website: **http://www.phoenixcon.com**
- End clamps for additional DIN-rail mountable product (see ordering data)

4.5 Mounting Pole

To accommodate the solar module bracket assembly provided with the SIS, the outside diameter of the mounting pole must be in the range of 63.5 mm to 76.2 mm (2-1/2 in. to 3 in.). See Figure 4-1 for an example configuration. In addition, the pole must accommodate an antenna and the SIS enclosure. Dimensions for the solar module and enclosure can be found in Section 2 of this manual.

4.6 Installing the SIS Enclosure

The white powder-coated aluminum unit is designed to meet NEMA 3R and NEMA 4 standards. Figure 4-2 is a wiring diagram of the various components that make up the SIS. The mounting system allows the enclosure to be mounted on a pole or to a wall. See Figure 4-3.

Note

The SIS enclosure has two mounting flanges, one at the top of the enclosure and one at the bottom of the enclosure. However, U-bolts or lag bolts have not been provided with the SIS for attaching the enclosure. Therefore, if U-bolts or lag bolts are needed to attach the enclosure, they will have to be obtained from your local hardware store.

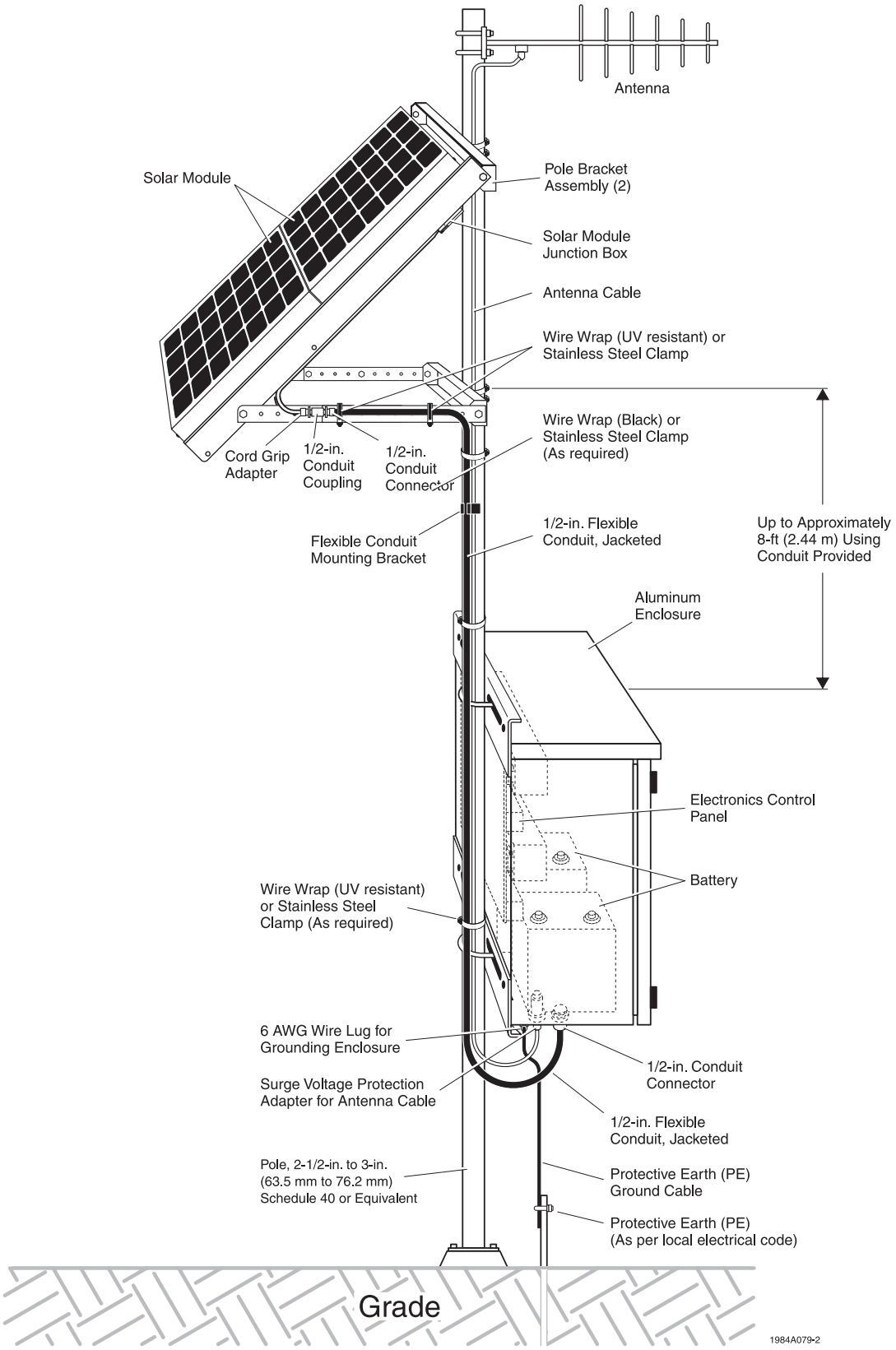
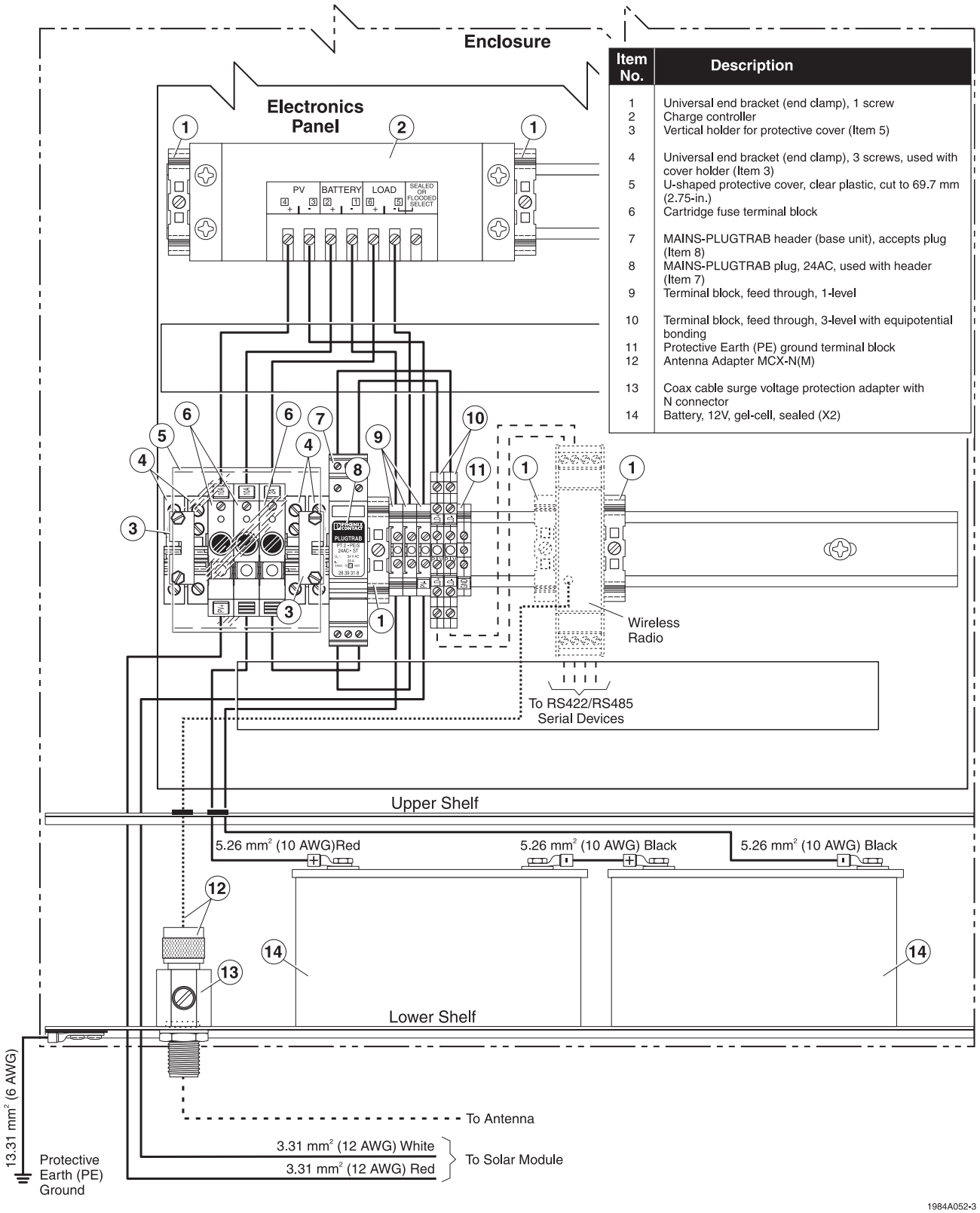
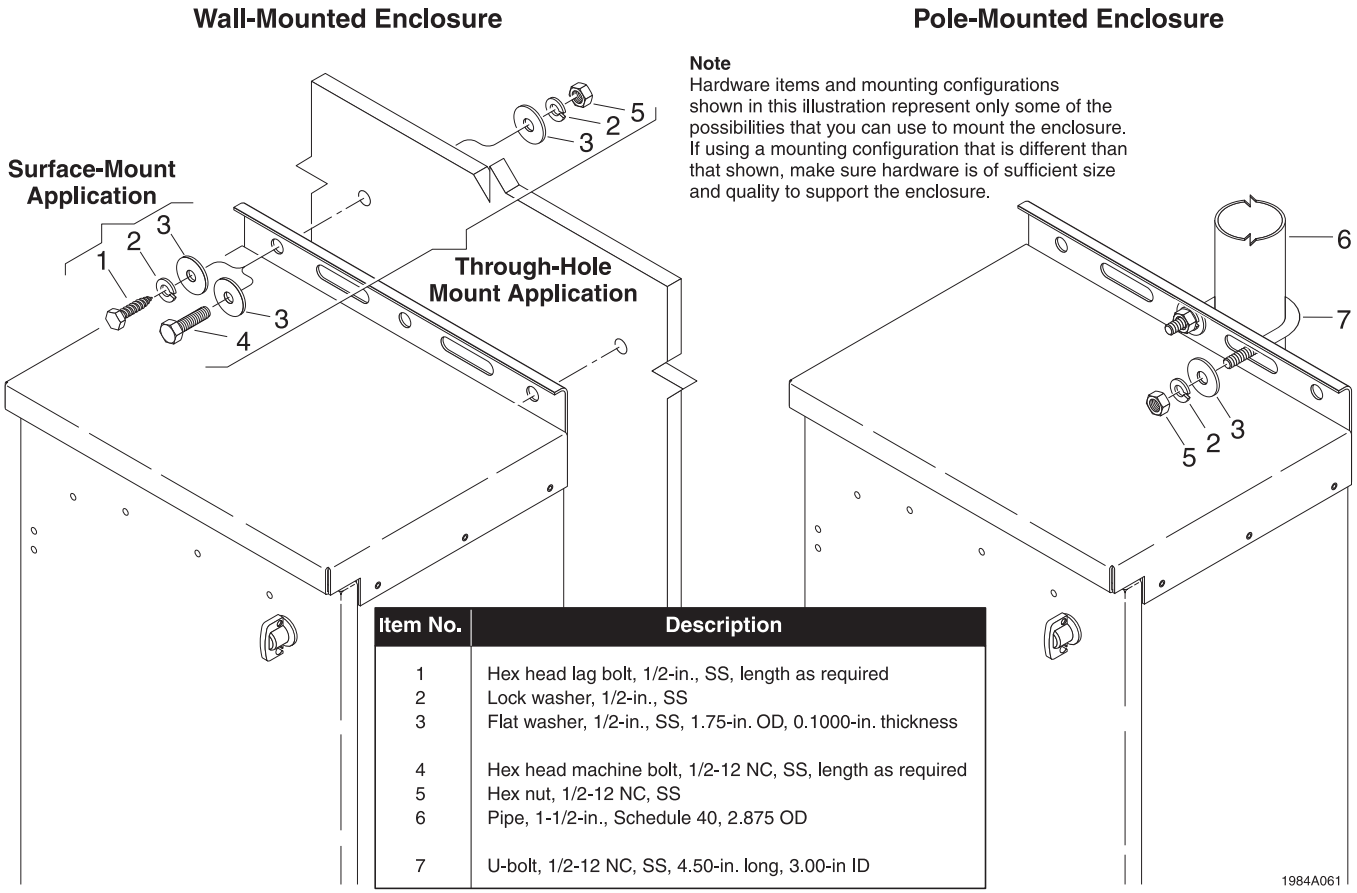

Antenna
Solar Module
Pole Bracket Assembly (2)
Solar Module Junction Box
Antenna Cable
Wire Wrap (UV resistant) or Stainless Steel Clamp
Wire Wrap (Black) or Stainless Steel Clamp (As required)
Cord Grip Adapter
1/2-in. Conduit Coupling
1/2-in. Conduit Connector
Flexible Conduit Mounting Bracket
1/2-in. Flexible Conduit, Jacketed
Up to Approximately 8-ft (2.44 m) Using Conduit Provided
Aluminum Enclosure
Electronics Control Panel
Battery
Wire Wrap (UV resistant) or Stainless Steel Clamp (As required)
6 AWG Wire Lug for Grounding Enclosure
Surge Voltage Protection Adapter for Antenna Cable
1/2-in. Conduit Connector
1/2-in. Flexible Conduit, Jacketed
Pole, 2-1/2-in. to 3-in. (63.5 mm to 76.2 mm) Schedule 40 or Equivalent
Protective Earth (PE) Ground Cable
Protective Earth (PE) (As per local electrical code)
Grade
1984A079-2

Figure 4-1. SIS Configuration Example



Item No.	Description
1	Universal end bracket (end clamp), 1 screw
2	Charge controller
3	Vertical holder for protective cover (Item 5)
4	Universal end bracket (end clamp), 3 screws, used with cover holder (Item 3)
5	U-shaped protective cover, clear plastic, cut to 69.7 mm (2.75-in.)
6	Cartridge fuse terminal block
7	MAINS-PLUGTRAB header (base unit), accepts plug (Item 8)
8	MAINS-PLUGTRAB plug, 24AC, used with header (Item 7)
9	Terminal block, feed through, 1-level
10	Terminal block, feed through, 3-level with equipotential bonding
11	Protective Earth (PE) ground terminal block
12	Antenna Adapter MCX-N(M)
13	Coax cable surge voltage protection adapter with N connector
14	Battery, 12V, gel-cell, sealed (X2)

Figure 4-2. SIS Configuration Wiring Diagram


Wall-Mounted Enclosure
Pole-Mounted Enclosure
Note
Hardware items and mounting configurations shown in this illustration represent only some of the possibilities that you can use to mount the enclosure. If using a mounting configuration that is different than that shown, make sure hardware is of sufficient size and quality to support the enclosure.
Surface-Mount Application
Through-Hole Mount Application
1
2
3
4
5
6
7
1984A061

Item No.	Description
1	Hex head lag bolt, 1/2-in., SS, length as required
2	Lock washer, 1/2-in., SS
3	Flat washer, 1/2-in., SS, 1.75-in. OD, 0.1000-in. thickness
4	Hex head machine bolt, 1/2-12 NC, SS, length as required
5	Hex nut, 1/2-12 NC, SS
6	Pipe, 1-1/2-in., Schedule 40, 2.875 OD
7	U-bolt, 1/2-12 NC, SS, 4.50-in. long, 3.00-in ID

Figure 4-3. Installing SIS Enclosure Earth Ground

4.7 System Grounding

The negative for your SIS must be connected to earth ground. On the bottom (lower shelf) of the enclosure, you will find a grounding terminal. See Figure 4-4. All SIS chassis grounds are channeled through this terminal.

This system should be grounded per the 2002 National Electric Code. Refer to Articles 690 and 250 of the NEC. We recommend using a 13.30 mm^2 (6 AWG) grounding cable (not supplied) for making the earth-ground connection.

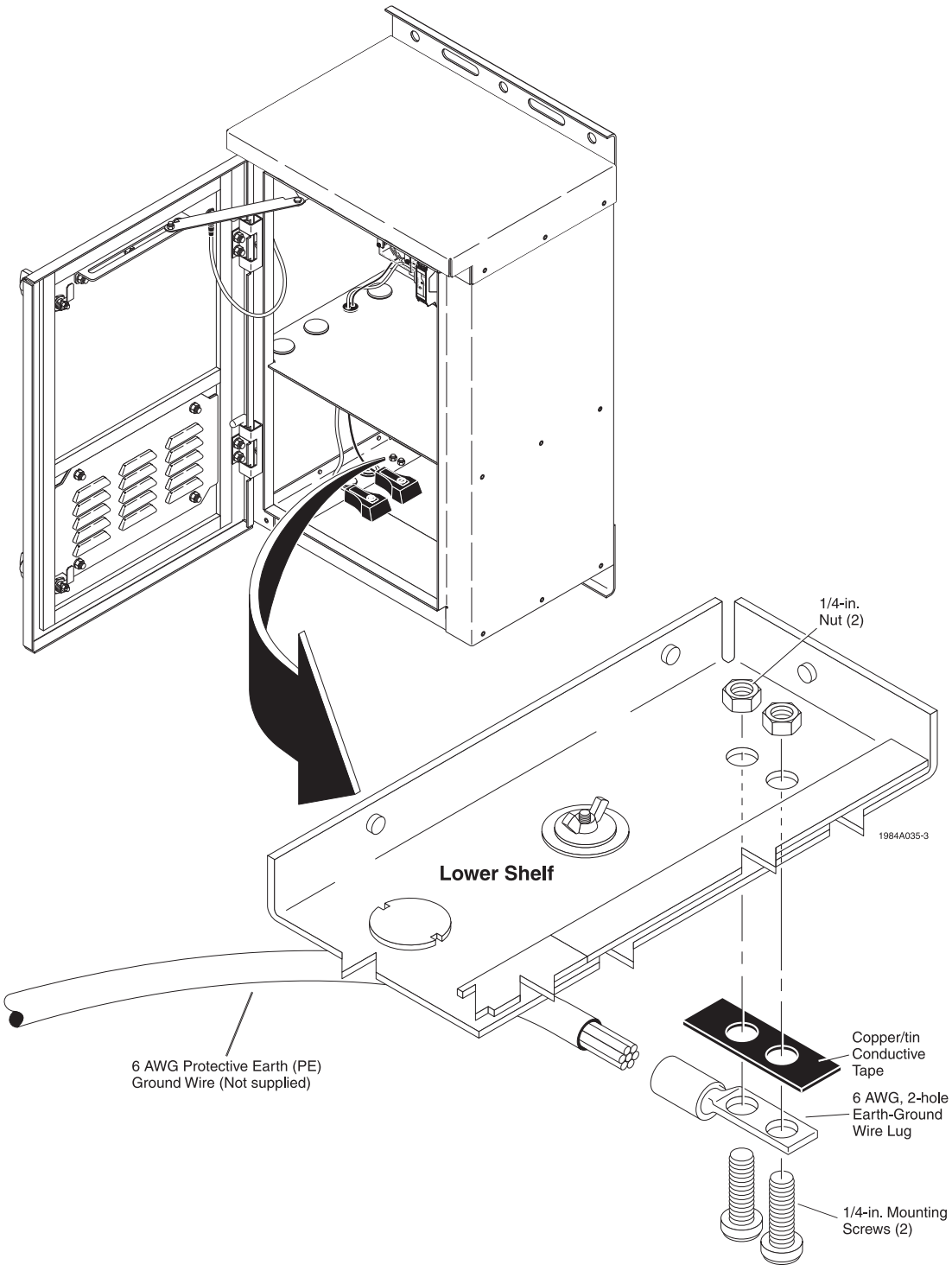


Figure 4-4. Enclosure Earth Ground Connection

4.8 Removing Fuses from Electronics Panel

⚠ WARNING

For your protection and protection of the equipment when making solar module, battery or load connections, always make sure that the SIS fuses are removed from the fuse terminal blocks located on the electronics panel of the enclosure.

Prior to installing the antenna, solar module or other equipment, remove the three fuses from the fuse terminal blocks on the SIS electronics panel. See Figure 4-5.

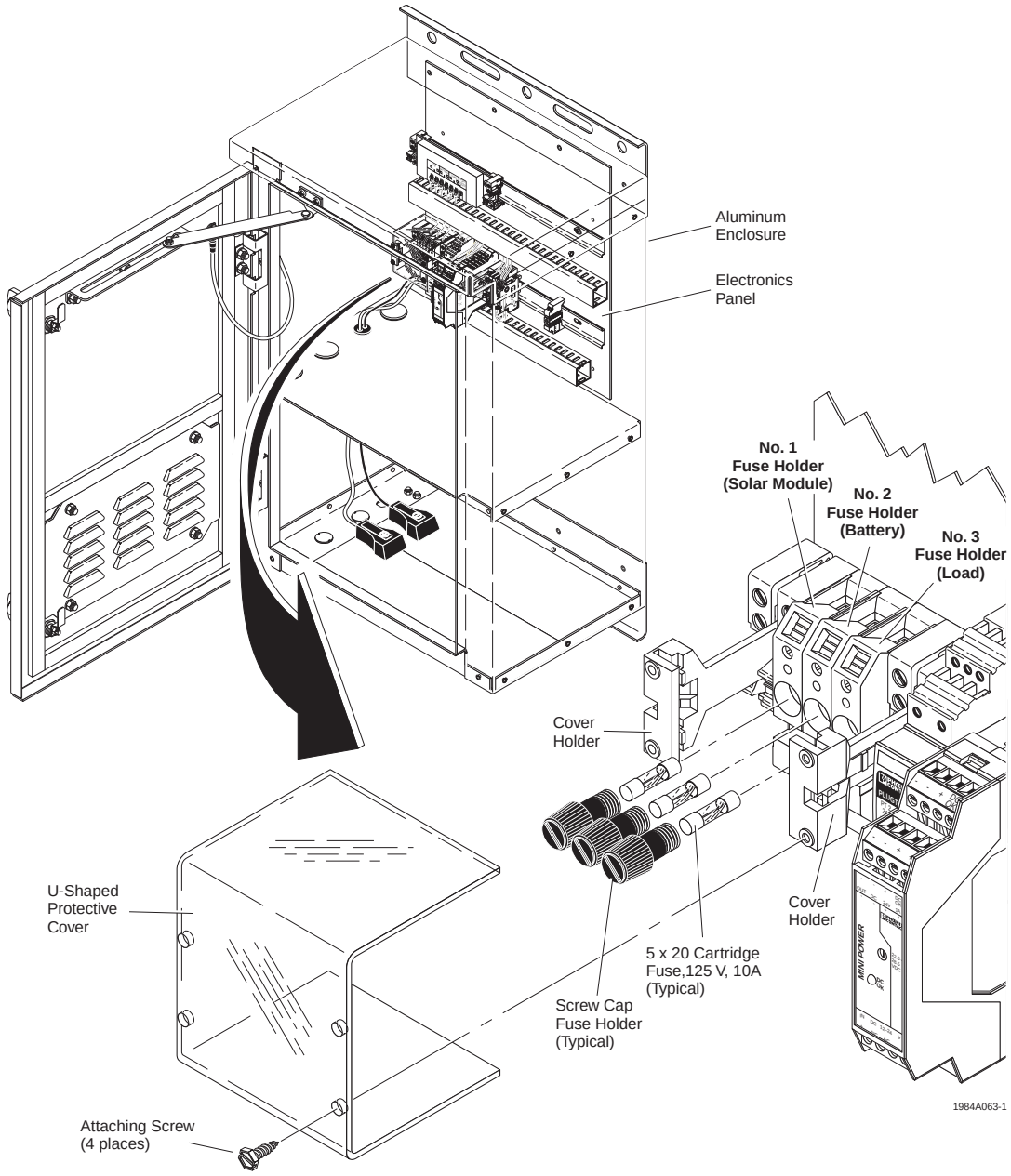


Figure 4-5. Solar Module, Battery and Load Fuses

4.9 Installing Coax Cable Surge Protector

Your SIS includes a coaxial cable surge protector for protecting the antenna and radio(s). Install the surge protector as described in the following procedure.

1. Locate the NEMA hole seal on the lower shelf and remove. See Figure 4-6, View A.
2. Fabricate and install a ground wire 2.08 to 1.31 mm^2 (14 to 16 AWG) between the surge protector and earth-ground terminal.
3. Install surge protector and tighten the lock nut.

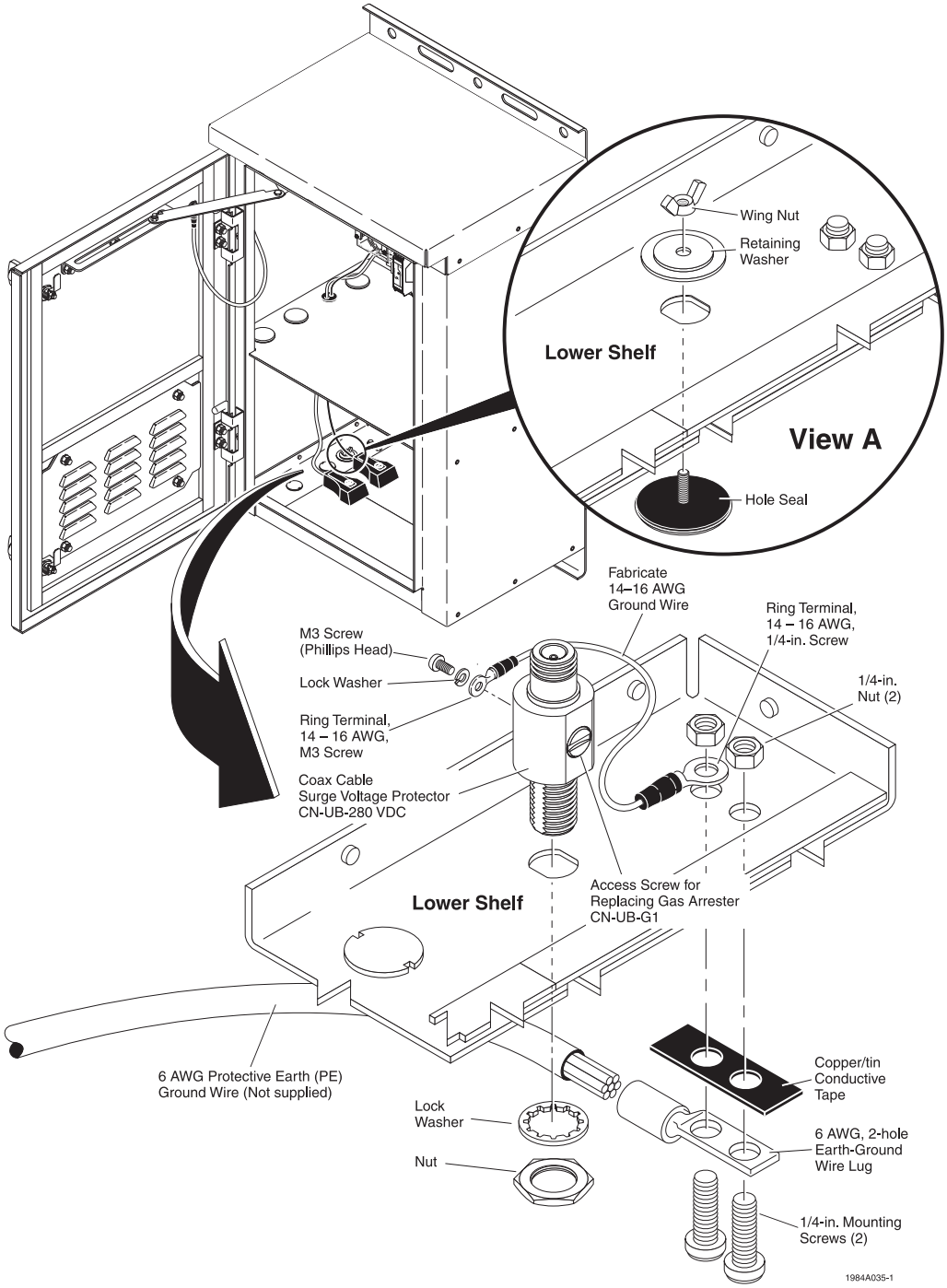


Figure 4-6. Installing the Coax Cable Surge Protector

4.10 Installing Radio and Antenna Adapter

1. Snap the radio onto the mounting rail. See Figure 4-7, View A. Secure the radio in place by installing an end bracket on either side of the radio.
2. Wire the radio as directed by the installation instructions that came with the radio. Once wired, plug the antenna adapter connector into the radio.
3. Remove the NEMA hole seal from one of the innermost holes in the upper shelf. See View B. Slide a hole grommet over the antenna adapter cable and install it into the hole. Then run the adapter cable down to the surge protector on the lower shelf. See View C.
4. Screw the antenna adapter connector onto the surge protector.

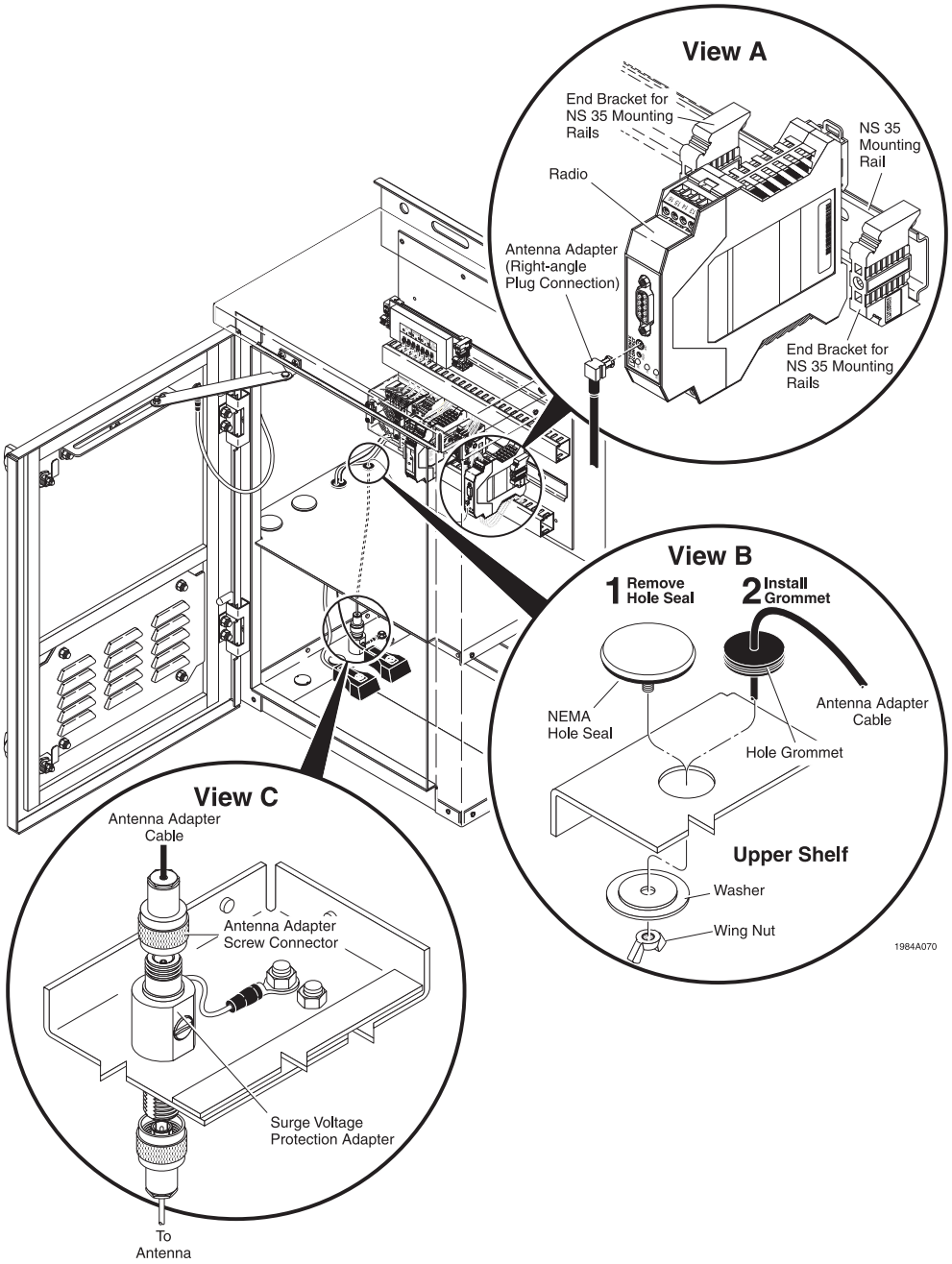


Figure 4-7. Installing Wireless Radio and Antenna Adapter

4.11 Installing the Solar Modules

Notes

A 4.57 m (15 ft) length of flexible conduit and two 6.09 m (20 ft) lengths of 3.31 mm^2 (12 AWG) wire (one red and one white) were supplied with the system. If the solar module is to be installed higher than 2.44 m (8 ft) above the enclosure, you will need to obtain a longer length of both the conduit and the two 3.31 mm^2 (12 AWG) wires.

Instructions for the solar module(s) have been provided with the system. Familiarize yourself with the instructions before installing your module.

1. Refer to Section 3 and calculate the solar module orientation and tilt angle for your geographical area.
2. Determine the height at which the solar module will be installed on the pole. Refer to Figure 4-1.

NOTE

To achieve the proper solar module orientation, the solar module bracket assembly will have to be rotated and repositioned after installation. Therefore, pole bracket clamps and solar module bracket bolts should not be tightened until bracket assembly is attached and properly oriented.

3. See Figure 2-1 for dimensions of the various solar modules.
4. Figures 4-8 and 4-9 show a typical installation of a side-of-pole mounting bracket assembly. Our example is based on the RAD-SOL-SET-24-80 system installed at an angle of 45°.
5. Using a blade-type screwdriver, loosely install the lower pole bracket at the desired height on the pole.
6. Loosely install the upper pole bracket approximately 800 mm (31-1/2 in.) above the lower pole bracket.

NOTE

Figures 4-8 and 4-9 show the bracket assembly struts configured for a tilt angle of 45°. The tilt angle is based on the length of the 2-piece telescoping strut assembly and the distance between the two pole brackets. Moving the inside strut inward (shortening total length) one hole position increases the tilt angle about 5°. Similarly, moving the strut outward (increasing total length) reduces the tilt angle about 5°. In addition, when changing total strut length, the distance between pole brackets will also change. The distance between pole brackets will increase for tilt angles greater than 45° or decrease for angles less than 45°.

7. Using Figures 4-8 and 4-9 as a guide, determine appropriate strut assembly length to achieve the required solar module tilt angle for your particular geographic location.
8. Set the struts to the determined length. Then using at least two bolts, fasten the two struts together and fully tighten. See Figure 4-8, View A-A. Next, loosely install the strut assemblies to the lower pole bracket using the attaching bolts.

9. Obtain the two solar module mounting rails. Loosely attach one of the mounting rails to the upper pole bracket using the attaching bolt. Similarly, loosely attach the second mounting rail to upper pole bracket.
10. Loosely attach each of the mounting rails to their corresponding strut assemblies at the proper hole location, previously determined.

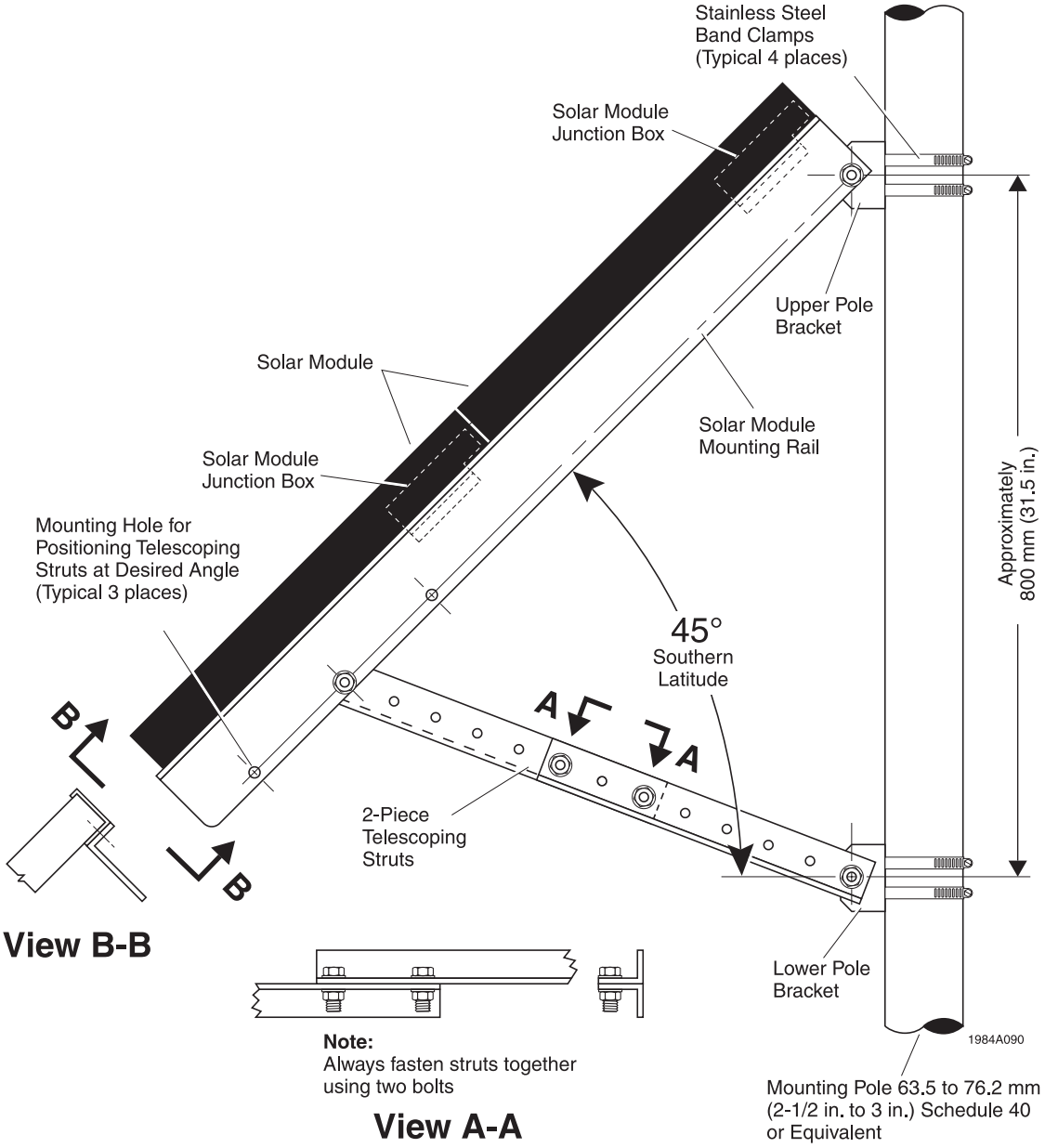


Figure 4-8. Setting Up the Solar Module Bracket Assembly (Our example uses a setup angle of 45°)

11. Position one of the solar modules so that the mounting holes at the top of the solar module frame are aligned with the holes in the upper mounting bracket. Then install and tighten the attaching hardware.
12. Position the solar module so that the mounting holes at the bottom of the solar module frame are aligned with the holes in the lower mounting bracket. Then install and tighten the attaching hardware.
13. Using a compass, rotate the lower pole bracket (including strut assembly and solar module) so that it is facing the proper geographical direction for your area. Then tighten the two lower pole bracket clamps.
14. Using a protractor, slide the upper pole bracket up or down on the pole until the desired solar module tilt angle is achieved.

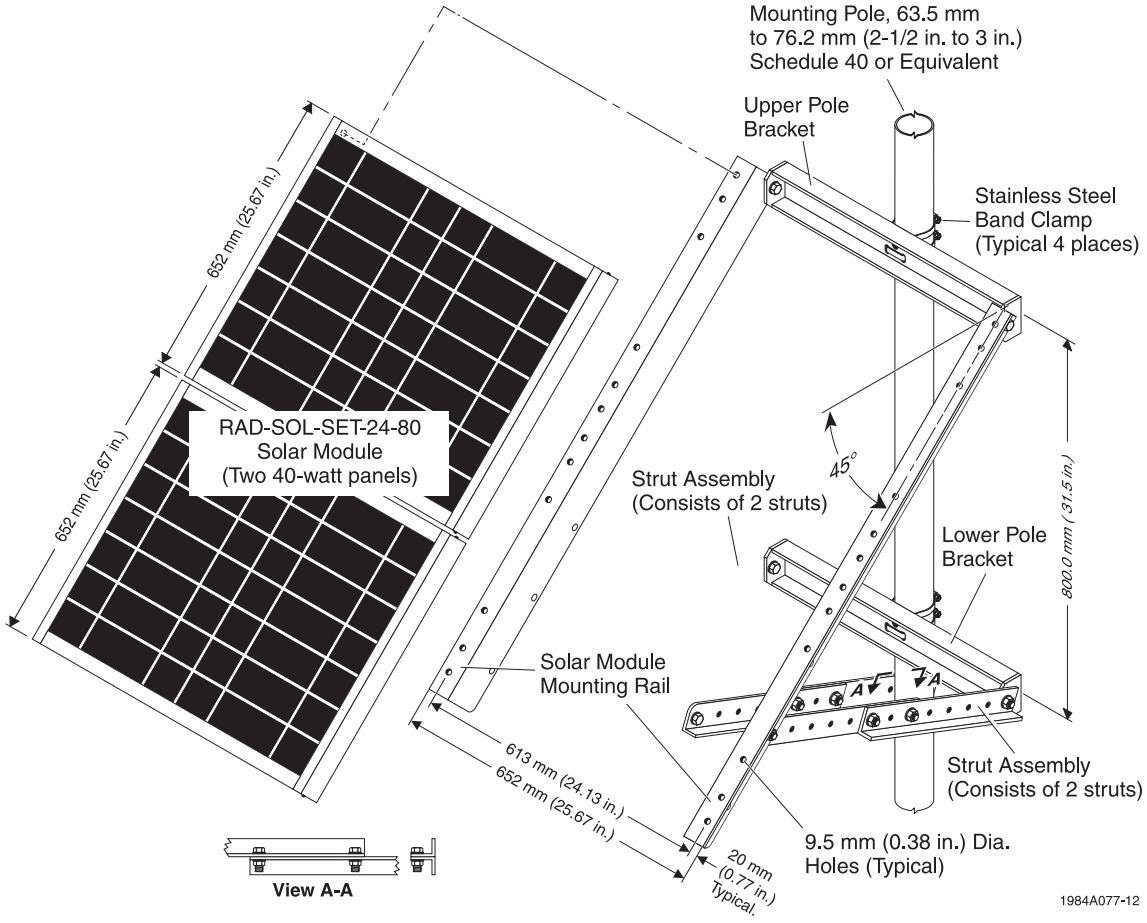


Figure 4-9. Installing the Solar Module Bracket Assembly

4.12 Wiring the Enclosure

⚠ WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Therefore, when working with PV modules or making wiring connections during the daytime, cover solar modules with an opaque material.

1. For safety, cover the solar module during installation and wiring to reduce the danger of arcing or shock.
2. Obtain the two 6.09 m (20 ft) 3.31 mm^2 (12 AWG) wires (red and white), flexible conduit 4.57 m (15ft), two
   12.7 mm (1/2 in.) conduit connectors, 12.7 mm (1/2 in.) coupling and 12.7 mm (1/2 in.) cord-grip connector supplied with your SIS.

4.12.1 Enclosure Wiring

1. Check that both ends of the conduit are cut straight and are not bent. If necessary, trim one or both ends of the conduit.
2. Remove the hole knockout from one of the enclosure hole locations. See Figure 4-10.
3. Obtain a conduit connector. Insert the body of the connector into the hole of the enclosure and install the locknut.
4. Slide the compression nut and compression ring over the watertight jacket of the conduit.
5. Screw the conduit end cap onto the end of the conduit.
6. Insert the end of the conduit into the connector body and tighten the compression nut.
7. Insert the two 3.31 mm^2 (12 AWG) wires into the flexible conduit. Leave approximately 76.2 to 91.44 cm (30 to 36 in.) of wire available at the enclosure to reach the enclosure's electronics panel.
8. Run the wires from the conduit through the enclosure's upper shelf. Install a hole grommet in the upper shelf as shown in Figure 4-11. Then run the wires up to the enclosure's electronics panel.
9. Cut wires to proper length and crimp a fork terminal to the end of each wire.
10. Attach the two wires to the enclosure's electronics panel. Refer to the wiring diagram shown in Figure 4-2 for wire terminations.
11. Assemble the conduit connector, conduit coupling and cord-grip connector as shown in Figure 4-12. Then attach the conduit to the bracket assembly.
12. Run the wires from the cord-grip connector to the solar module junction box.

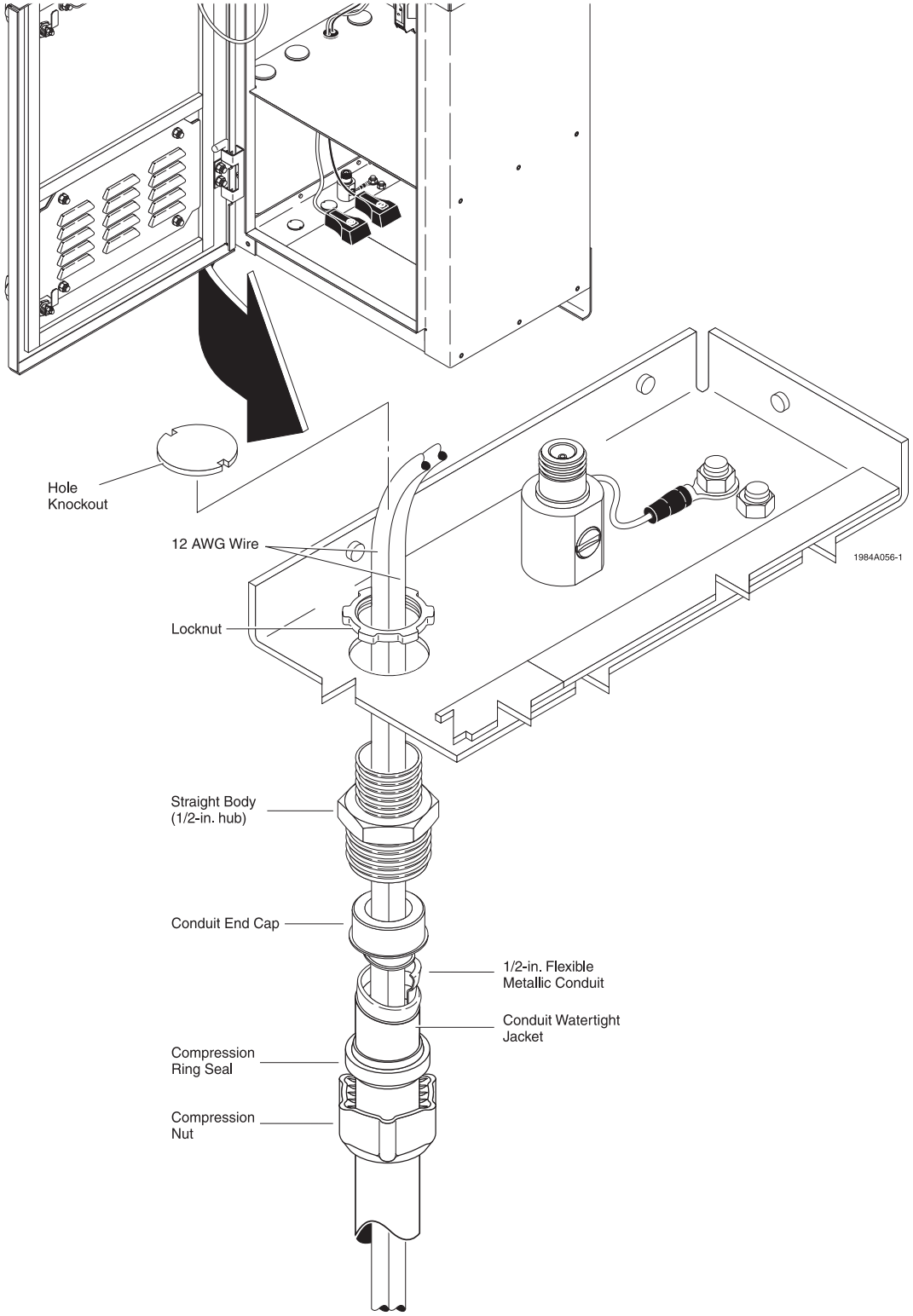


Figure 4-10. Conduit Connection at Enclosure

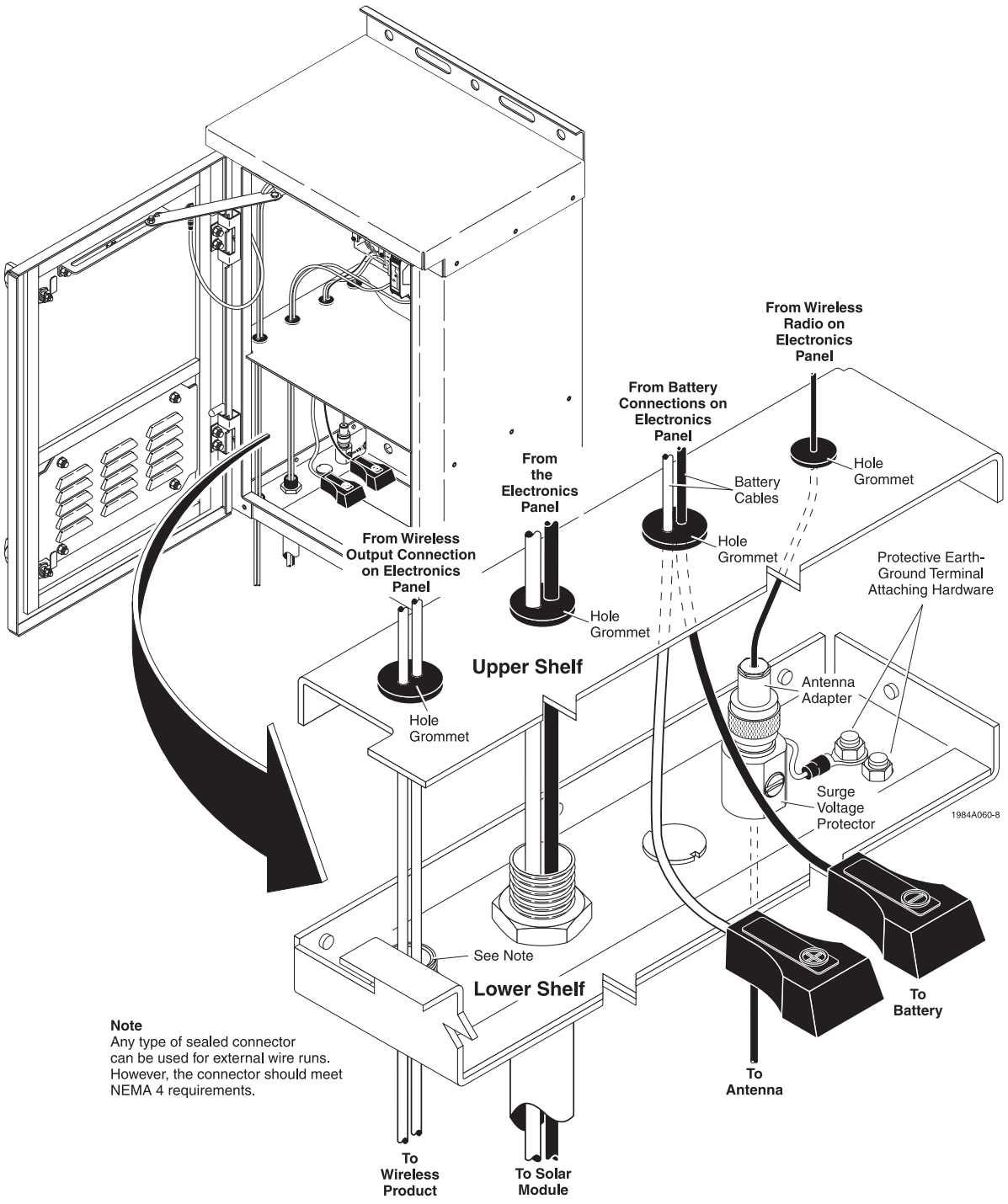


Figure 4-11 . Example of Shelf-to-Shelf Wiring

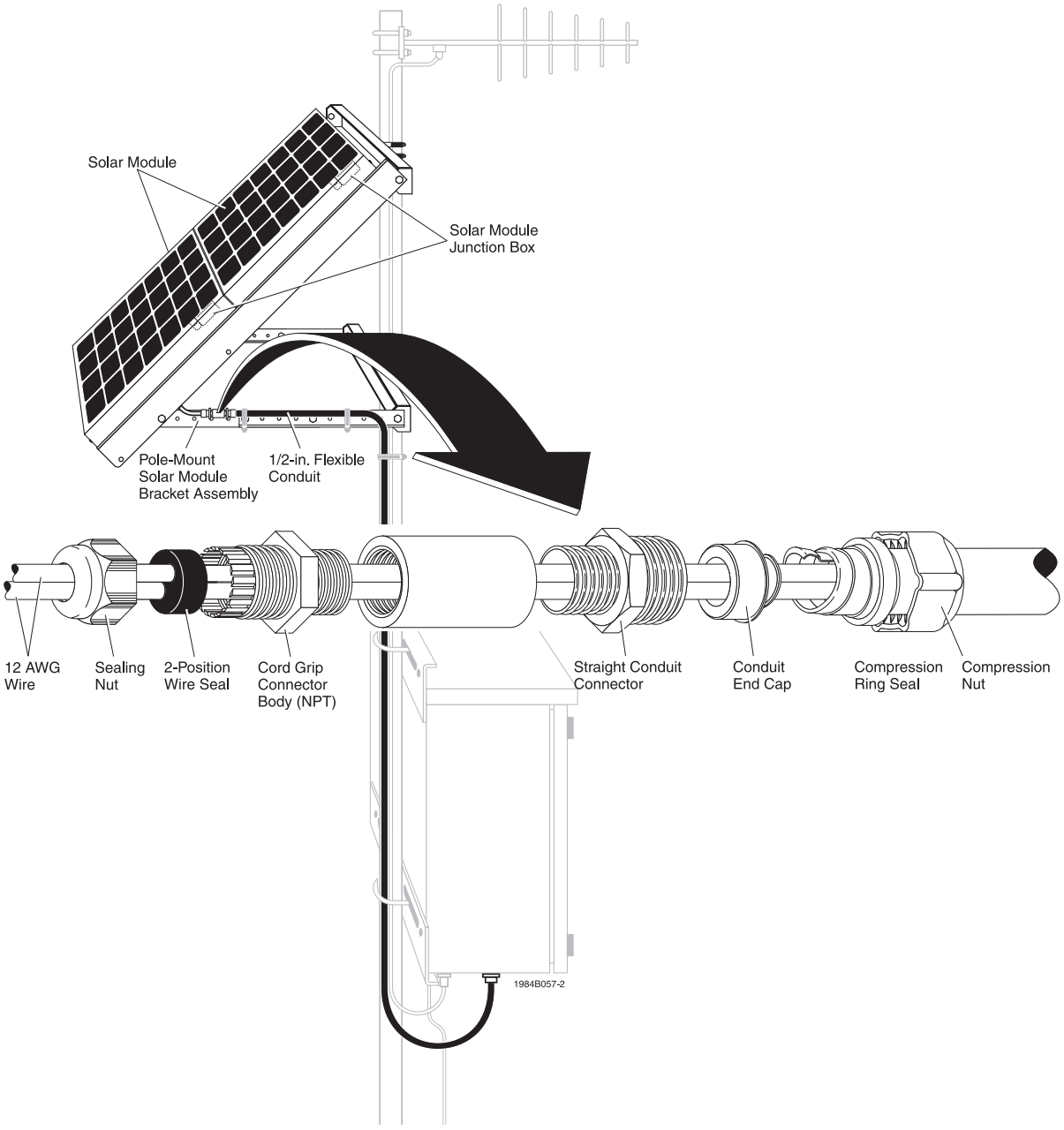


Figure 4-12. Conduit Connection at Solar Module

4.12.2 Wiring the Solar Module Junction Box

⚠ WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Therefore, when working with PV modules or making wiring connections during the daytime, cover solar modules with an opaque material.

1. For safety, cover the solar module during installation and wiring to reduce the danger of arcing or shock.
2. Cut the wires to the solar module junction box to desired length. Then strip the wires as shown in Figure 4-13.

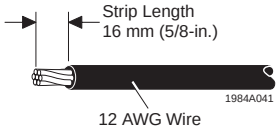
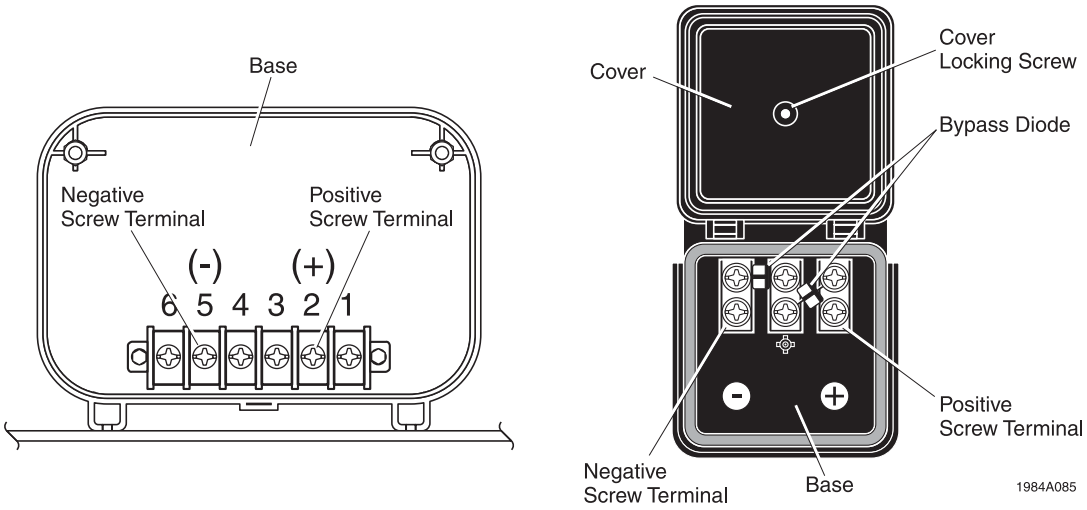


Figure 4-13. Wire Size and Strip Length Requirements

3. Remove the screws from the cover of the junction box and open the cover. See Figure 4-14.

Note

The junction box has two hole positions for installing watertight conduit fittings. Straight-through fittings have been supplied with your SIS. These fittings will also act as strain reliefs for the conduit.



RAD-SOL-PAN-24-20
RAD-SOL-PAN-24-30
Solar Modules

RAD-SOL-PAN-24-40
RAD-SOL-PAN-24-50
Solar Modules

Figure 4-14. Solar Module Junction Boxes

4. Locate the two hole knockout positions in the junction box. Then remove the knock-outs from the holes.
5. Install the watertight fittings in the holes as shown in figure 4-15.

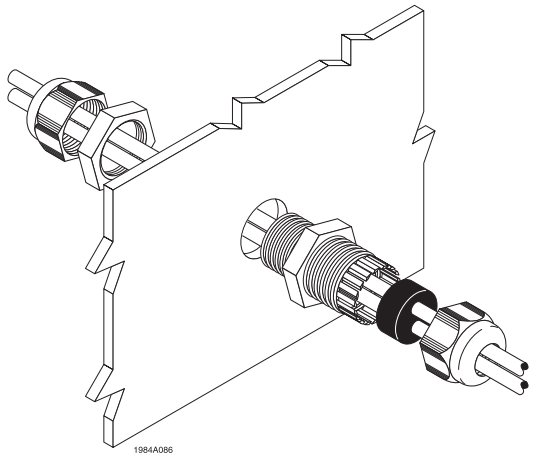


Figure 4-15. Installing Watertight Conduit Fittings

Note

Solar modules are connected in series.

⚠ WARNING

For your safety, leave the opaque cover over the solar module until all wiring tasks have been completed.

6. Run a 3.31 mm^2 (12 AWG) red wire from the control cabinet through the watertight fitting and into the junction box of the first solar module. See circuit diagrams in Figure 4-16.
7. Crimp a wire lug onto the end of the red wire. Then connect the red wire to the positive terminal.
8. Run a 3.31 mm^2 (12 AWG) red wire from the junction box of the first solar module through the conduit and watertight fitting of the second junction box. Crimp a wire lug onto the end of the wire and connect it to the appropriate terminal of the second junction box.
9. Run a 3.31 mm^2 (12 AWG) white wire from the control cabinet through the watertight fitting and into the junction box of the first solar module. See circuit diagrams in Figure 4-16.
10. Crimp a wire lug onto the end of the white wire. Then connect the white wire to the appropriate terminal.
11. Run a 3.31 mm^2 (12 AWG) white wire from the junction box of the first solar module through the conduit and watertight fitting of the second junction box. Crimp a wire lug onto the end of the white wire and connect it to the appropriate terminal.

⚠ CAUTION

Make sure that wires are connected properly. Check that terminal screws and watertight fittings are tight.

12. Check all wire connections. Then install the junction box cover plate.

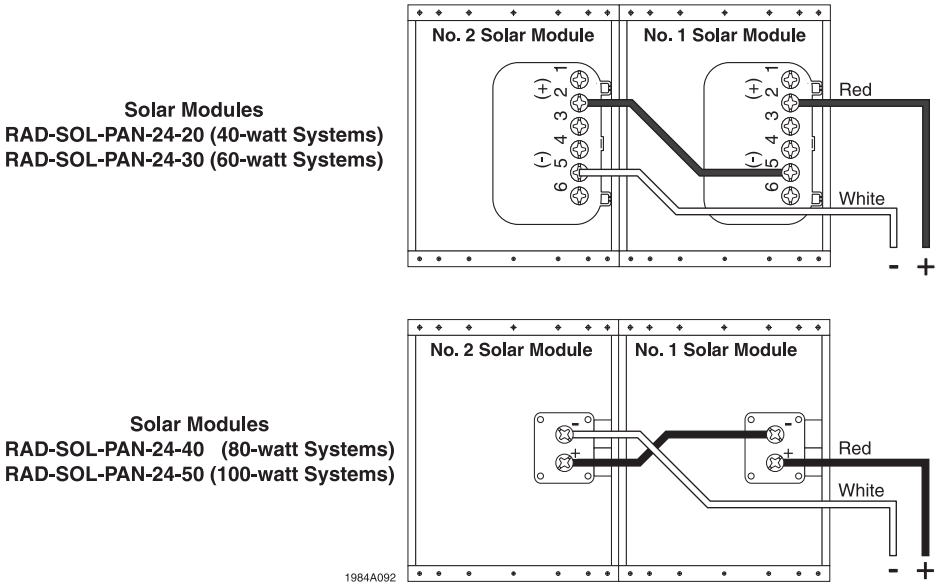


Figure 4-16. Circuit Diagrams for Series Wiring of Two Solar Modules

4.12.3 Grounding the Solar Module

CAUTION

If the mounting pole or structure is nonconductive, we recommended running a separate wire to earth ground. Grounding should be in accordance with the 2002 National Electric Code. Refer to articles 690 and 250 of the NEC.

1. Attach a 5.26 mm^2 (10 AWG) wire to the solar module as shown in Figure 4-17. Then run the wire to a suitable earth ground.

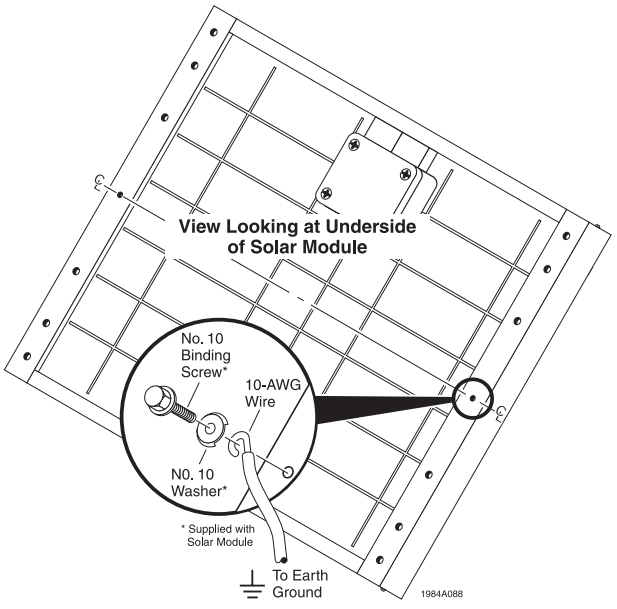


Figure 4-17. Grounding of Solar Module

4.13. Installing the Antenna

Install the antenna per the antenna mounting instructions. Phoenix Contact offers a variety of antenna solutions. See the title page of this manual for contact information.

Note

The antenna cable plugs into the surge protector in the SIS enclosure. Therefore, when installing the antenna, make sure that the enclosure end of the antenna cable has an industry standard N-type male connector.

4.14 Installing Flexible Conduit Mounting Brackets

Your SIS package contains three flexible conduit mounting brackets. See Figure 4-18. To meet specification, the distance between brackets should be 0.914 m (3 ft) or less. See Figure 4-1 for approximate placement of the mounting brackets.

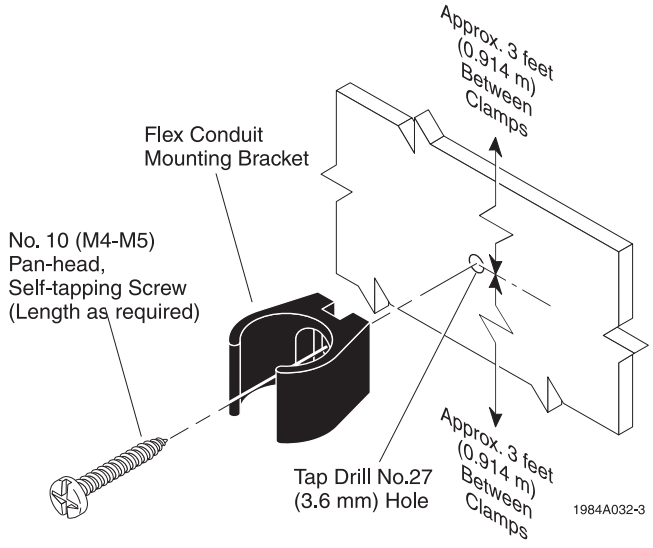


Figure 4-18. Flexible Conduit Mounting Bracket

4.15 Installing the Battery

CAUTION

Use caution when making battery connections. Your system has two 12-volt batteries. Battery-to-battery interconnect cables are connected in series.

SIS batteries are shipped fully charged. However, if batteries have been in storage for a long period of time, the charge in the battery may be weakened. We recommend that you always check the resting open-circuit voltage of the battery to avoid problems. If voltage reads below 12.4 volts, recharge the batteries before they are installed. Always use a well regulated constant-voltage charger. Set charger no higher than 13.8 volts at a charge rate of no more than 10 amps per battery.

WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Therefore, when working with PV modules or making wiring connections during the daytime, cover solar modules with an opaque material.

WARNING

For your protection and protection of the equipment when making solar module, battery or load connections, always make sure that the SIS fuses are removed from the fuse terminal blocks located on the electronics panel of the enclosure.

1. For safety, cover the solar module during installation and wiring of the battery to reduce the danger of arcing or shock. Also check that the fuses have been removed from the fuse terminal blocks. If fuses have not been removed, shut down your SIS as described in Section 5 of this manual.

WARNING

To prevent short circuits and damage to the equipment when installing the battery: (1) Exercise extra caution when placing the battery into the enclosure. (2) Always double check your positive and negative polarity before connecting the battery cables. Always use insulated tools when working on electrical equipment.

2. Figure 4-19 shows the serial cable connections for the SIS two-battery configuration. You should become familiar with the layout of these connections.

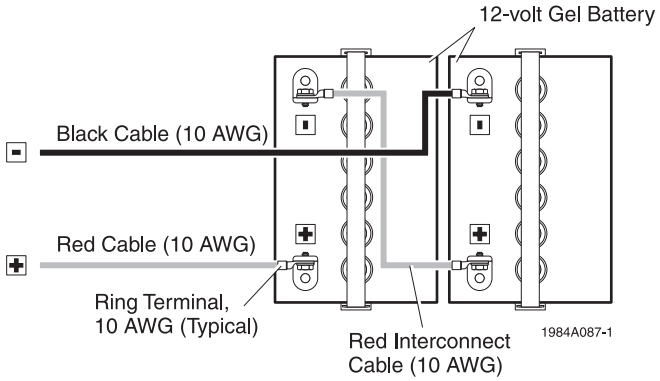


Figure 4-19. Diagram Showing Two Batteries Connected in Series

3. Using a 7/16-in. wrench, remove the attaching bolts, flat washers and lock washers from the positive and negative terminal post of both batteries. See Figure 4-20.
4. Carefully place the batteries on the rubber mat in the battery compartment.
5. Slide back the protective boot on the red battery cable. Then using a 11.1 mm (7/16 in.) wrench, attach the cable to the battery's negative post.
6. Slide back the protective boot on the black battery cable. Then using a 11.1 mm (7/16 in.) wrench, attach the cable to the battery's positive post.
7. Check to make sure that the black cable is attached to the negative post and the red cable is attached to the positive post.

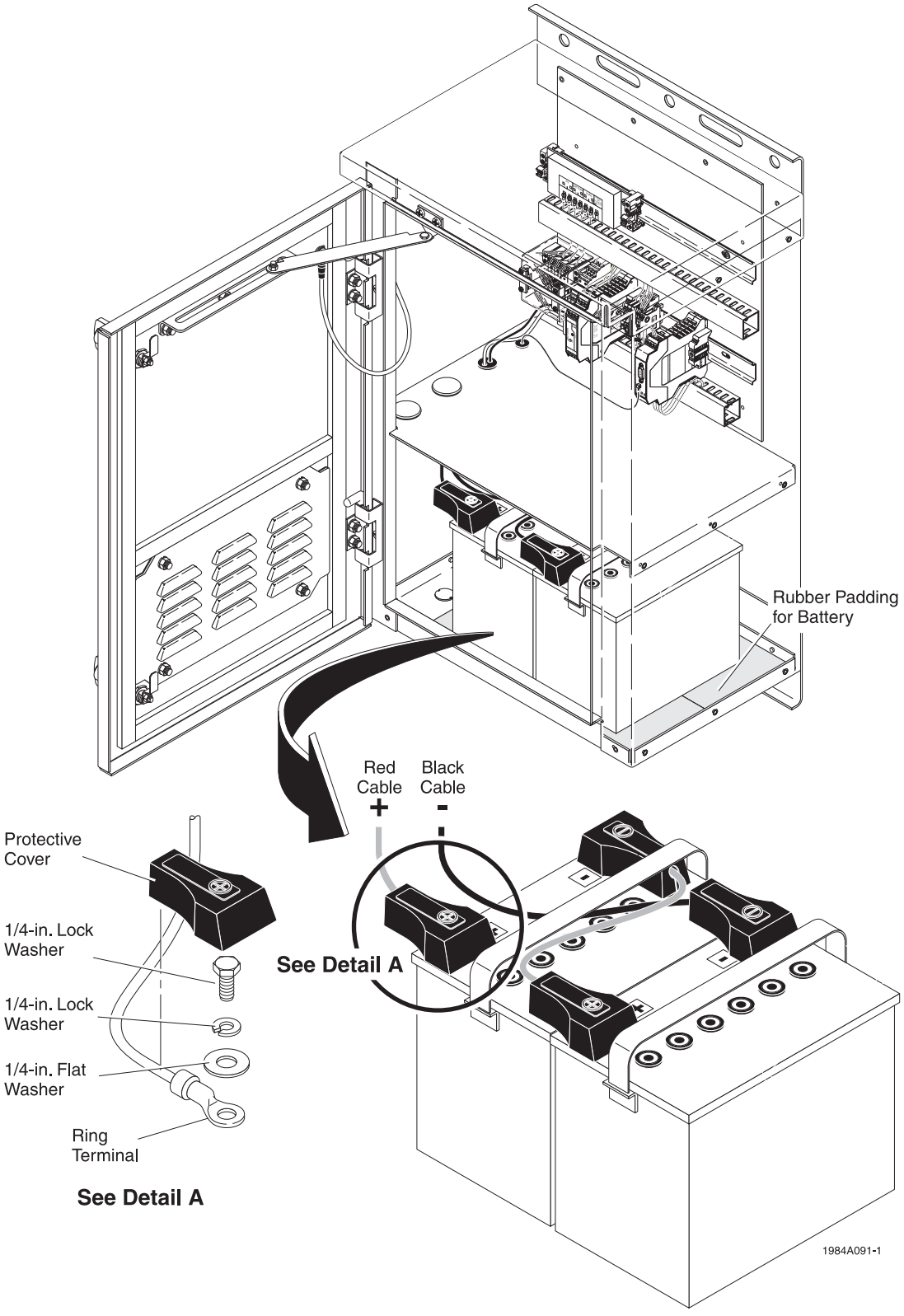


Figure 4-20. Installing the Batteries

4.16 Final Checkout

Before installing fuses to energize your system, check the following parameters:

1. Check your solar module input wiring for proper open-circuit voltage and polarity.
2. Check your battery wiring for proper voltage and polarity.
3. Check polarity of wiring to loads.

CAUTION

To avoid damage to the electronic components during start-up and shutdown modes, fuses must be removed and reinstalled in the proper sequence. Refer to Section 5 of this manual for the proper start-up and shutdown procedures.

4. Once your battery connections have been made and you have checked your polarity carefully, energize the system by installing the three fuses as described in Section 5 of this manual.

SECTION 5
Start-up & Shutdown Procedures

Section 5 Contents

5 .1 Start-Up 5-1
5.2 Shutdown 5-2

5.1 Start-Up

Once the solar module, battery and load connections have been made and you have checked your polarity carefully, energize the system by installing the three fuses in the order described in the following paragraphs. See Figure 5-1.

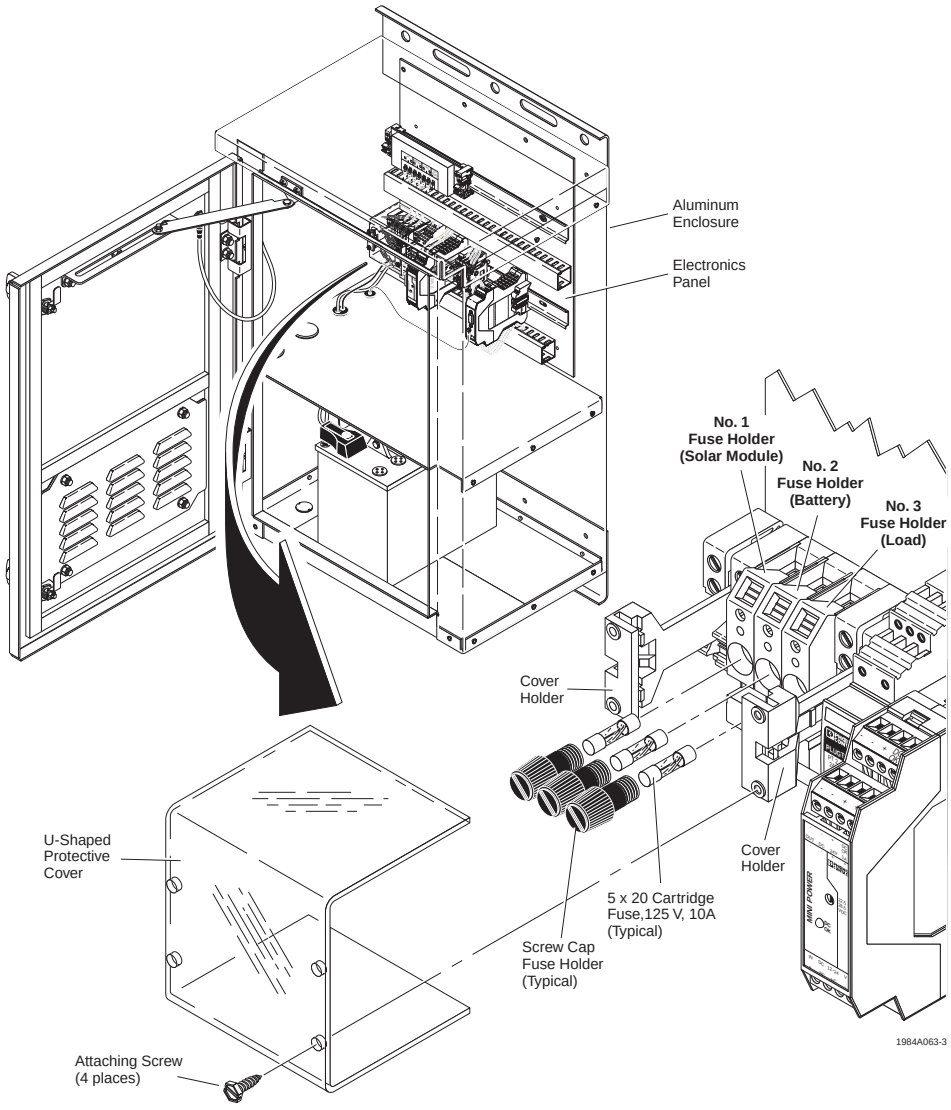


Figure 5-1. Fuses for Solar Module, Battery and Load

1. Install fuse No. 2 (Battery). See Figure 5-1. This will connect the battery to the charge/load controller. Check battery voltage at the controller terminals 1 and 2 under BATTERY.
2. Install fuse No. 3 (Load). See Figure 5-1. This applies DC battery voltage to the charge/load controller terminals 5 and 6 under LOAD. Next, check that load operations are functioning properly.
3. Install fuse No. 1 (Solar Module). See Figure 5-1. Once fuse No. 1 is installed, you should see the green charging LED on the charge/load controller light up. See Figure 5-2. Furthermore, depending on sunlight intensity, you should see the battery voltage start to rise. Your solar array output will depend directly on sunlight intensity. Only during the peak sun hours on a very clear day will you see the full rated current from the array.

5.2 Shutdown

1. When shutting down the system, it is always best to remove fuse No. 1 (Solar Module) first. Refer to Figure 5-1. Then remove fuse No. 2 (Battery) and fuse No. 3 (Load). This will remove the high voltage charging source from the circuit. Normally, you do not want to have the solar module array active (fuse installed) without the battery circuit activated.

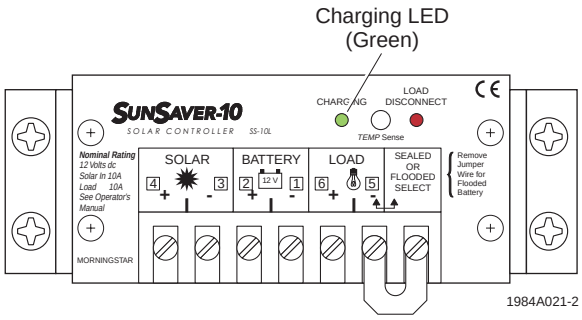


Figure 5-2. Charge/Load Controller Charging LED

SECTION 6
Charge Controller

Section 6 Contents

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6.1 General

The SunSaver charge controller is a fully automatic controller for photovoltaic systems. See Figure 6-1. It provides electronic protective functions for both the controller and solar modules. The batteries are charged using an algorithm for pulse width modulation with constant voltage, which has been optimized for photovoltaic systems.

Key:

1. Green LED “CHARGING” - charging the batteries
2. Red LED “LOAD DISCONNECT” - Load disconnection because battery voltage is too low
3. Terminal connections for solar modules
4. Terminal connections for batteries
5. Terminal connections for the loads
6. Jumper for selecting the battery type (sealed battery or flooded battery)

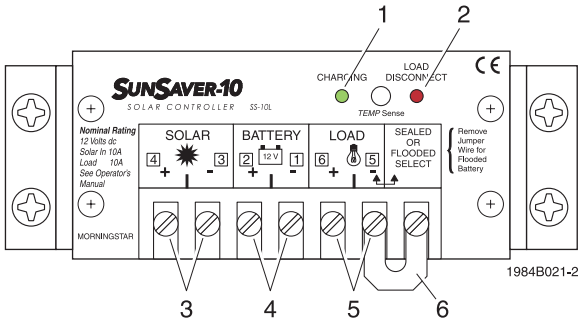

Figure 6-1. SunSaver Charge Controller

CAUTION

The solar system is delivered with two gel-type batteries (sealed batteries). When using this type of battery, the jumper (6) must NOT be removed.

6.2 General Safety Precautions

Keep this manual in a safe place (e.g. in the enclosure) for future reference. It contains important information that must be observed when installing and maintaining the SunSaver charge controller and the batteries.

6.2.1 Charge Controller

⚠ WARNING

- **The nominal voltage and the nominal current of the charge controller must not be exceeded. Only use a charge controller with a 24-volt battery (or two 12-volt batteries connected in series).**
- **Do NOT short circuit the solar modules and the loads as long as they are connected to the charge controller. Otherwise, damage to the charge controller may occur.**
- **Protect the charger controller against direct sunlight. Also ensure that there is adequate space for air circulation around the charge controller.**

  Only use copper wires with a minimum insulation rating for 75° (167°F) and a cross section of at least 3.31 mm² (12 AWG).
- **Ground the negative wire of the system according to local regulations.**

6.2.2 Batteries

⚠ WARNING

- **Exercise extra caution when handling the batteries. Lead-acid batteries may produce explosive gasses and high short-circuit currents.**
- **Observe all the instructions supplied with the battery.**

6.3 Connecting the Charge Controller

The SunSaver charge controller is mounted on a vertical surface in the control cabinet. Adequate space for air circulation is provided above and below the controller.

⚠ CAUTION

Make sure that the current strength of the solar module and the loads does not exceed the rated values of the SunSaver model installed.

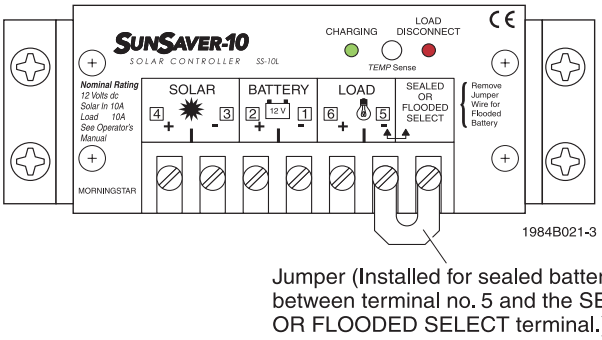

Figure 6-2. SunSaver Charge Controller Terminal Number Identification and Jumper

The six connection terminals of the charge controller are labeled on the controller and must be connected as described in the following steps and in accordance with the wiring diagram shown in Section 4, Figure 4-2. Figure 6-2 identifies the SunSaver charge controller's terminal numbers and the jumper location.

CAUTION

Make sure that live wires do NOT touch the metal housing of the charge controller.

1. Connect the batteries to terminals (1) and (2) under the heading "BATTERY."
2. Connect the solar modules to terminals "3" and "4" under the heading "SOLAR." Note that the green LED "CHARGING" will light up as soon as the solar modules generate current.
3. Connect the loads to terminals "5" and "6" under the heading "LOADS." Note that if the red LED "LOAD DISCONNECT" is on, the battery voltage is too low. In this case, recharge the batteries prior to starting the system.

Note

When using sealed batteries, make sure the jumper is installed between terminal "5" (under the heading "LOAD") and the terminal labeled "SEALED OR FLOODED SELECT." Refer to Figure 6-2.

CAUTION

The solar system is delivered with two gel-type batteries (sealed batteries). When using this type of battery, the jumper must NOT be removed.

Do NOT connect any wires from ("SOLAR"), ("BATTERY") or ("LOAD") terminals to the "SEALED OR FLODED SELECT" terminal.

4. Ground the negative pole of the battery to ensure efficient grounding of the solar system.

6.4 Indication Elements

6.4.1 Green LED

The green LED "CHARGING" will come ON as soon as sunlight is available for charging the battery. The LED will be OFF in the dark.

The SunSaver charge controller charges the batteries using a pulse-width modulation method. Therefore, the battery is always provided with a certain amount of power. Although the charging current is very low when the batteries reach their fully charged state, the green LED is ON (during daylight). This indicates proper operation of the charge controller.

6.4.2 Red LED

SunSaver models with an automatic load disconnect (LVD – Low Voltage Disconnect) function are provided with a red "LOAD DISCONNECT" LED. As soon as the charging state of the batteries falls below the low voltage disconnect set point, the load is disconnected and the red LED will come ON. This indicates that the controller has disconnected the load to protect the batteries from deep discharging and possible damage.

If after some charging time, the batteries reach 40 to 50% of their normal power, the load is automatically reconnected and the red LED will go OFF.

6.5 Operation

With all fuses installed, the system should be operating normally. During normal operation, depending on weather conditions, the battery voltage will vary from approximately 23.0 to 28.6 volts. If the battery voltage falls below 23.0 volts, the controller will go into LVD (Low Voltage Disconnect) and open the load connections. It will then let the batteries recharge up to approximately 25.2 volts before reconnecting the loads to the battery.

During normal operation, the battery voltage should not change rapidly. During the day and after a night of discharge, the voltage will climb slowly up to the charge regulation set point. Depending on the present and previous sunlight conditions, the batteries may or may not reach the full charge regulation set point during the day.

6.6 Errors

WARNING

Electricity, even at low voltages, can be very dangerous. For your protection, Phoenix Contact recommends that all electrical installations, maintenance and repairs be performed only by licensed and/or properly qualified individuals and in strict accordance with applicable health, safety, building and electrical codes.

CAUTION

A battery may cause serious damage when short circuited.

Observe all precautions when working on live circuits. The SunSaver charge controller does not contain fuses, circuit breakers or parts that can be maintained by the user.

6.6.1 Battery Not Charging

The following procedure lists the basic steps for removing an error.

1. Check if green "CHARGING" LED is ON. During the day, the green LED must be ON.
2. Check if the correct battery type (sealed or flooded) has been selected. Refer to Paragraph 6.3 for "Connecting the Charge Controller."
3. Check that all wires have been connected properly to the terminals.
4 Check all terminals for correct polarity (+ or -).
5. Measure the open-circuit voltage of the solar module as described under Paragraph 6.7 ("Solar Charging System").

⚠ WARNING

Remove the solar module fuse. See Figure 6-3. Then disconnect the solar modules from the load controller.

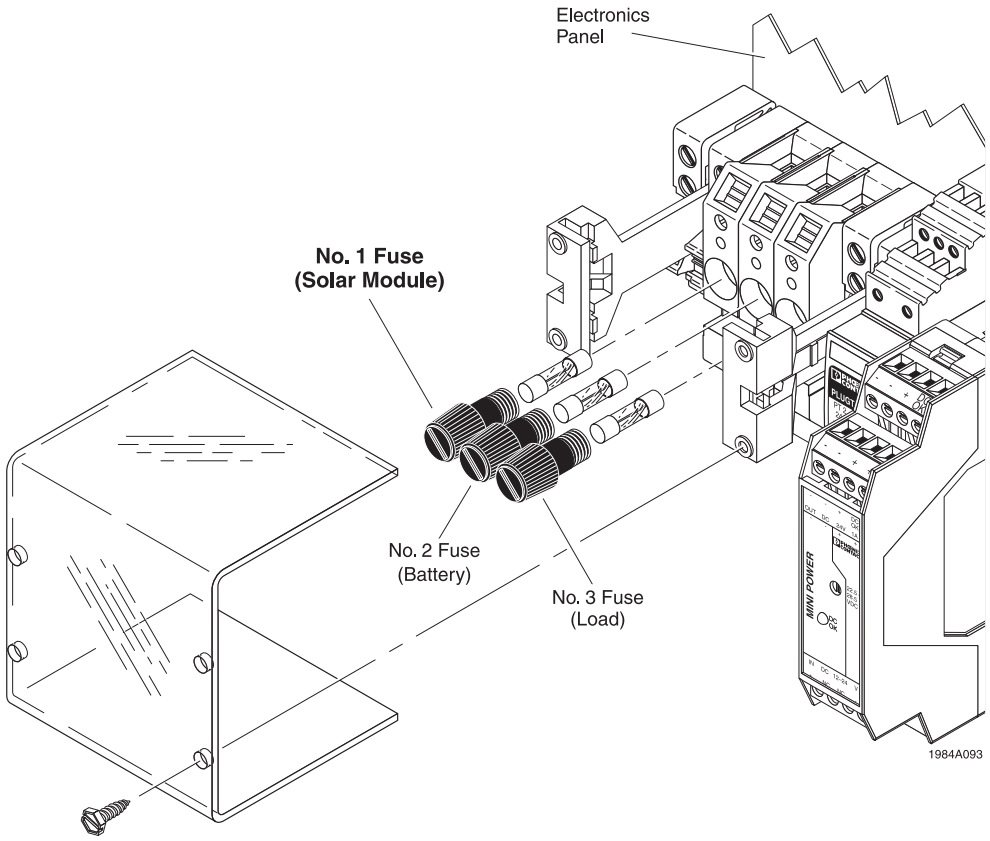

Figure 6-3. Solar Module, Battery and Load Fuses

Note

As solar isolation varies around the world, different permissable loads are available.

6. Measure load to see if it exceeds the maximum solar isolation power available to the system.
7. Check for voltage drops between the charge controller and battery. A high voltage drop would cause inadequate charging of the batteries.

8. Disconnect the battery cables from terminals no. 2 and no. 3 of the charge controller. Then measure the voltage between the cables. If battery voltage is reduced, the battery(ies) may be damaged or defective. Replace battery(ies) if necessary.
9. Measure the voltage of the solar modules and the voltage of the battery at the charge controller.
   a. If voltages at the terminals are the same (within one or two-tenths of one volt), the solar modules are charging the batteries.
   b. If the photovoltaic voltage is almost as low as the open-circuit voltage of the cells, and the battery voltage is low, the charge controller is not charging the batteries. Check battery for damage or defects.

6.6.2 Battery Voltage is Too High

1. Check if the maximum end-of-charge voltage (14.1 V to 14.7 V) is exceeded.
2. Check if the correct battery type (sealed or flooded) has been selected. Refer to Paragraph 6.3 for "Connecting the Charge Controller."
3. Check that all wires have been connected properly to the terminals.
4. Disconnect the solar modules from pins 3 and 4 of the charge controller.
   a. With solar modules disconnected, unhook the wire momentarily from the positive pole of the battery. Then reconnect it. At this point the green "CHARGING" LED should be OFF.
   b. With solar modules disconnected, measure the voltage at the SOLAR terminals 3(-) and 4(+) of the charge controller. If the green "CHARGING" LED is ON, or if battery voltage is present at the SOLAR terminals, the charge controller might be damaged. Replace charge controller if necessary.
   c. Reconnect the solar modules to pins 3 and 4 of the charge controller.

6.6.3 Operating Error of the Load

1. Check if voltage is applied at the load.
2. Check if a system fuse has failed. See Figure 6-3. The charge controller does not contain any fuses or circuit breakers.
3. Check that the load and other terminals on the charge controller and on the battery have been connected properly.
4. Check that voltage drops in the system wiring are not too high.
5. Check that LEDs on the charge controller indicate the proper state. Refer to Figure 6-1.
   a. If the red "LOAD DISCONNECT" LED is ON, the load has been disconnected because of low battery voltage. This is a normal state if the load requires more power than that provided by the solar modules. Poor weather or sunlight conditions could exist.
6. Measure the voltage between "BATTERY" terminals 1(-) and 2(+) on the charge controller. If voltage is below the low-voltage disconnect value, power will not be available to the load.
7. Measure the voltage between "LOAD" terminals 5(-) and 6(+) of the charge controller. If no voltage is present, the charge controller might be damaged. Replace if necessary.

6.6.4 System Goes Into Low Voltage Disconnect (LVD) State Too Often

If the system is going into LVD too often, your daily load power draw may have exceeded the solar system output.

a. Recalculate your present load requirement . If the recalculation shows that the solar system is properly sized, batteries with a higher capacity or a larger solar module can be used.
b. Please contact Phoenix Contact Technical Support if the calculation shows that the dimensions of your solar system are not sufficient. Here you will learn whether it is possible to expand the components in order to increase the output power of your solar system.
c. Your sealed gel-cell batteries should last between 2 to 4 years depending on the regular depth of discharge and temperature experienced. A symptom of diminished battery capacity is the load working during the day, but not at night. In this case, the battery voltage drops down to the LVD or load disconnect set point at night and then rises up out of LVD in the day with the solar charging current.

   You will see evidence of this during the day if you turn the solar module on and off. If the voltage falls rapidly with the solar module off, and then rises rapidly when turned on, it is time to replace the batteries.

Note

Spare batteries are available from Phoenix Contact. See Section 7, Ordering Data.

6.7 Solar Charging System

During normal operation, the available current from the solar module(s) will be fed through the controller directly to the batteries until the *Charge Termination Voltage* is reached. If you suspect a problem with charging from the solar module, check the following.

6.7.1 Test the Solar Module – *Open Circuit Voltage*

⚠ WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Unless sunlight is required for testing purposes, always cover the face of the solar module(s) completely with an opaque material to stop the production of electricity.

First, remove fuse No.1 (Solar Module) from its fuse holder. See Figure 6-1. Using a multimeter, check the voltage at the PV+ and PV- terminals of the charge controller. Voltage should read between 18 and 21 volts, depending on solar module cell temperature. If not, you may have a problem with the solar modules. Next, check each module separately. If you suspect a problem, contact Technical Support at 1-800-322-3225.

6.7.2 Test the Solar Module – *Short Circuit Current*

WARNING

Solar modules can produce hazardous voltages whenever exposed to sunlight, even when not in full sunlight. Therefore, when working with PV modules or making wiring connections during the daytime, cover solar modules with an opaque material.

First, remove fuse No.1 (Solar Module) from the fuse holder. See Figure 6-1. You will need to use a digital multimeter configured for DC amps. Carefully isolate each solar module in your array and connect the meter probes to the PV+ and PV- terminals of the solar module. You should be reading the maximum *Short Circuit Current* for the given sunlight intensity on the solar module. Short circuit current varies with sunlight intensity. You will probably see less than the full rated amps most of the time. Estimate the given sunlight intensity and correlate it with the current reading. Refer to Section 2 for the voltage and current specifications of your modules. If you suspect a problem, contact Technical Support at 1-800-322-3225.

SECTION 7
Ordering Data

Section 7 Contents

7.1 General 7-1

7.1 General

This section provides the information necessary to identify the various components of your solar interface system and to order replacement parts.

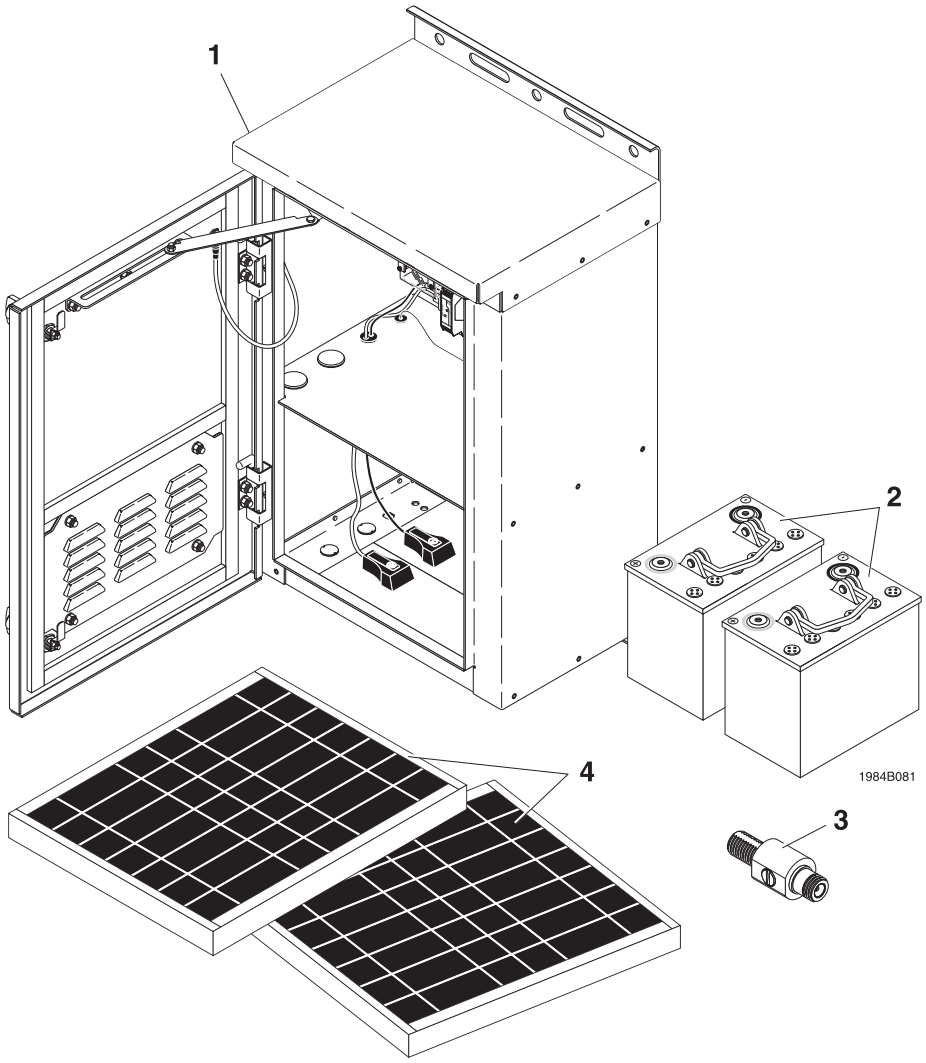

Figure 7-1. SIS Components

Table 7-1. Parts List for Figure 7-1*

Item No.	Description	Type	Pcs/ Pkg	Order No.
-	Solar interface system, 24-volt, 40-watt	RAD-SOL-SET-24-40	1	56 05 94 1
-	Solar interface system, 24-volt, 60-watt	RAD-SOL-SET-24-60	1	56 05 94 2
-	Solar interface system, 24-volt, 80-watt	RAD-SOL-SET-24-80	1	56 06 28 5
-	Solar interface system, 24-volt, 100-watt	RAD-SOL-SET-24-100	1	56 05 94 3
1	Enclosure aluminum (prewired with electronics)	RAD-SOL-ENCL-24V	1	28 85 58 2
2	Battery, 12-volt, gel valve-regulated, sealed, 40 Ah	RAD-SOL-BAT-12-40	2	56 06 94 5
2	Battery, 12-volt, gel valve-regulated, sealed, 70 Ah	RAD-SOL-BAT-12-70	2	56 06 94 6
2	Battery, 12-volt, gel valve-regulated, sealed, 84 Ah	RAD-SOL-BAT-12-84	2	56 06 94 7
3	Coax cable surge protection adapter (for radio antenna)	CN-UB-280DC-BB	1	28 18 85 0
4	Solar module, 20 W	RAD-SOL-PAN-12-20	2	See Note
4	Solar module, 30 W	RAD-SOL-PAN-12-30	2	See Note
4	Solar module, 40 W	RAD-SOL-PAN-12-40	2	28 85 55 3
4	Solar module, 50 W	RAD-SOL-PAN-12-50	2	28 85 45 6

* Additional components available upon request.

Note: Panel is available through special order. Contact your sales representative.

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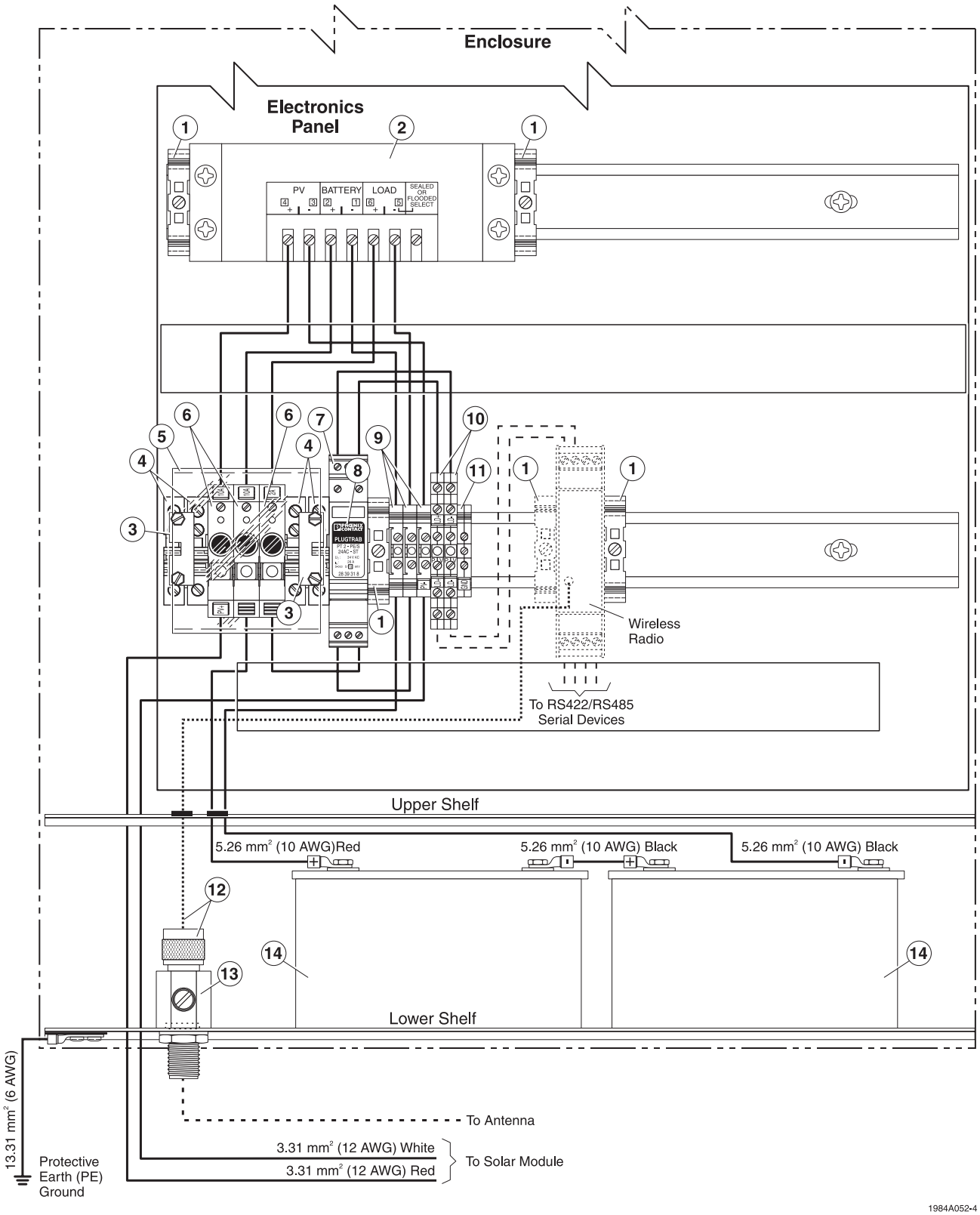

Figure 7-2. SIS Enclosure Electronics Panel

Table 7-2. Parts List for Figure 7-2*

Item No.	Description	Type	Order No.
1	Universal end bracket (end clamp), 1 screw	E/NS 35 N	08 00 88 6
2	Charge controller	RAD-SOL-CHG-24-10	28 85 44 3
3	Vertical cover holder for protective cover (Item 5)	VAH	12 01 46 8
4	Universal end bracket (end clamp), 3-screws, used with cover holder (Item 3)	E/UK	12 01 44 2
5	U-shaped protective cover, clear plastic, cut to 69.7 mm (2.75-in.)	A/U, 69.7 mm lg.	50 21 11 0-M
6	Cartridge fuse terminal block	UK10-DREHSI (5x20)	30 05 10 9
7	MAINS-PLUGTRAB header (base unit), accepts plug (Item 8)	PT-BE/FM	28 39 28 2
8	MAINS-PLUGTRAB plug, 24AC, used with header (Item 7)	UK 5 N	28 39 31 8
9	Terminal block, feed through, 1-level	MINI-PS-12-24DC/24DC/1	30 04 36 2
10	Terminal block, feed through, 3-level with equipotential bonding	DIKD 1.5-PV	27 15 09 2
11	Protective Earth (PE) ground terminal block	USLKG 5 N	04 41 50 4
12	Antenna adapter, right-angle MCX-N (M)	RAD-CON-MCX-90-N-SS	28 85 20 7
13	Coax cable surge voltage protection adapter	CN-UB-280DC-BB	28 18 85 0

* Additional components available upon request.

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SECTION 8
Warranty/Repair Information

Section 8 Contents

8.1 Solar Interface System (SIS) Limited Warranty 8-1

8.1 Solar Interface System (SIS) Limited Warranty

Phoenix Contact Inc. warrants its Solar Interface System products against defects in materials and workmanship under normal use and service for a period of 12 months from the date of purchase.

During the warranty period, products determined by Phoenix Contact to be defective, shall at the option of Phoenix Contact, either be repaired at a location authorized by Phoenix Contact (and returned free of charges for parts, labor, or shipping), or replaced with an equivalent product. Defective parts replaced by Phoenix Contact shall become the property of Phoenix Contact. This Limited Warranty does not cover on-site repair of products. Defective products must be returned to Phoenix Contact to be repaired or replaced. Phoenix Contact is not responsible for the operation, damage, availability, or loss of use, of the customer-supplied equipment being used with a Solar Interface System (SIS).

This warranty is void under the following circumstances:

1. Abnormal use of the product or use in violation of the instructions provided in this manual.
2. Improper and/or unauthorized installation or repair of system components.

The information given herein is based on data believed to be reliable, but Phoenix Contact makes no warranties expressed or implied as to its accuracy and assumes no liability arising out of its use by others. This publication is not to be taken as a license to operate under, or recommendation to infringe, any patent.

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